STRATEGIC STUDIES QUARTERLY

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Commentary

Feature Article

Perspectives

Book Reviews

Our Brick Moon

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In 1869—four years after Lincoln was assassinated and 34 years before the Wright Brothers flew at Kitty Hawk—an author named Edward Everett Hale, born in 1822 in Boston, wrote a short story for the *Atlantic Monthly* called "The Brick Moon."

"The plan was this," Hale wrote. "If from the surface of the earth, by a gigantic peashooter, you could shoot a pea upward, aimed northward as well as upward, if you drove it so fast and far that when its power of ascent was exhausted, and it began to fall, it should clear the earth, and pass outside the North Pole, if you had given it sufficient power to get it half round the earth without touching, that pea would clear the earth forever."

I like that in 1869 he even had our terminology right, with "ascent." What Hale was proposing with his "brick moon" was a man-made companion to the North Star, one that would hang above Greenwich and provide an easy way to measure longitude at a glance—essentially, a primitive GPS.

Hale saw many potential problems with this brick moon. He wrote, "The brick alone will cost sixty thousand dollars. Sixty thousand dollars! There the scheme of the Brick Moon hung, an airy vision, for seventeen years." Actually, a lot of the story is taken up with the characters seeking funding to build their moon. Think of the similarities today. Many great ideas, but how do we fund them?

The story talks about the modular way the brick moon was built, because it was too hard to launch all the bricks at once. It talks about the advantages and opportunities of viewing the earth from such a high place and about how the moon communicates with the earth. It talks about the difficulties in getting supplies to the brick moon, because they keep

burning up in the atmosphere or damaging the moon if they do not land softly enough. It even talks about the experiments the people living on the moon run, because their land is so different from the land of the narrator.

In short, the story is about a space station; though, of course, the term did not yet exist. It is precisely our space station today. If you walk into a sixth-grade classroom today, the teacher will be the only person in the room who saw the entire human race on the planet Earth at the same time. Think about that: three to six people have been living off planet on the International Space Station (ISS) for more than 11 years.

It has been said a lot lately that NASA is retreating from space exploration, and nothing could be further from the truth. In fact, we are continuing upon a steadily increasing proficiency in space exploration that leads us up to this very moment.

You already know this, of course, but I want to prove it to you with some statistics. The SpaceShipOne guys spent a little more than an hour's total time in suborbital flight. Next up was the one-man Mercury program, which kept six of the Mercury seven in space for a grand total of two days, five hours, and 53 minutes. After that is China's Shenzhou program, which over three flights has kept its crews in space for eight days and 20 hours. In general, every follow-on program spends more time in space with more people than the one that came before it. We have been learning over the past 40 years how to fly humans in space. The big three have been the space shuttle, Mir, and the International Space Station. Over the course of the 98 shuttle flights that did not go to the ISS, crews spent a total of 1,062 days in space. Keep in mind, that is not man-hours, that is the number of days humans lived in space aboard the shuttle. Mir is next. Over nearly 10 years, rotating crews of usually three stayed on Mir a total of 3,644 days.

As of its anniversary on 2 November 2011, crews had lived aboard the ISS for 4,017 days. The last few years of that total, there have been six people onboard, doubling the amount of crew time ever available on Mir. If we project out to 2020 and even 2030, we can see that the ISS will easily surpass the cumulative experience of humanity in space by a very large margin. We are not retreating from space exploration. "Courage, my friends, we are steadily advancing to the Brick Moon," Edward Hale wrote.

The ISS continues this trend in crewed launches into space. Nearly every follow-on program has launched more crews more times into space for longer periods of time. The ISS is not a retreat. It is continued progress.

Ignoring unmanned cargo launches, the ISS has had 66 launches with crews onboard—37 space shuttles and 29 *Soyuzes* in 11 years. In 10 years, Mir only saw 39 launches—30 *Soyuzes* and nine shuttles.

To compare the two longest-serving manned vehicles, the total number of manned *Soyuz* launches was 123, versus 135 for the space shuttle. I am willing to bet that number surprises some of you. We actually have more flight experience with manned shuttles than the Russians do with manned *Soyuzes*. They have flown longer but not as often.

Even with the downtime after *Columbia*, we have flown at a far greater rate far more reliably than ever before. The shuttle really was a true space transportation system.

The space station dominates in extravehicular activity (EVA) time as well. International crews wearing US extravehicular mobility units and Russian Orlan suits have spent a cumulative 42 days outside building the ISS. That is 42 24-hour days, not workdays, over the course of 161 spacewalks. It is also only slightly less time spent on EVA than every other manned program in history, worldwide, combined—including Apollo and Mir. We are working in space.

International Cooperation and Research

So what does this all mean? Since the ISS is international in nature, it means we have spent the last 14 years—or 26, depending on how you are counting—learning to live and work together in space. The result has been the most quantitatively prolific space vehicle built by humanity. Now, what are we doing with it?

It has been a long rocket ride from Ronald Reagan's 1984 Space Station *Freedom* announcement to today. Along the way we have had to overcome nearly every conceivable obstacle, from budget cuts to launch failures to technical challenges on-orbit. However, in even the limited amount of research time we have had until recently, when we finished assembly, we have found some impressive results in the unique laboratory of space.

One of our "big science" projects involved the collaboration, skill, and tenacity of scientists and engineers literally around the world. The Alpha Magnetic Spectrometer, or AMS, was launched onboard shuttle *Endeavour* in May 2011, though that is definitely not the start of its history. The first AMS prototype experiment flew on *Discovery* in 1998 and paved the way for the development of the detector that is now on ISS.

Research has shown us that there are more than one hundred hundred million galaxies in the universe. Once again—a hundred, hundred million. Each of those galaxies has perhaps one hundred billion stars in it. And yet, observations have shown that all of those stars and galaxies are less than 5 percent of the total mass of the universe. The theory of dark matter and dark energy has been developed to explain what is basically most of the missing universe. The AMS may help us find all that missing stuff, and I must commend the research team for not aiming too big.

As we all know, the only thing harder than finding nearly all of creation is putting together a team to build the instrument to do so. The AMS's principle investigators are from the United States, Spain, France, Italy, Taiwan, Germany, and Switzerland, leading a team of 60 institutes from 16 countries that was sponsored by the US Department of Energy. I cannot be sure, but this team may perhaps represent 5 percent of all known particle physicists in the universe.

The international aspects were not the only challenge, of course. The AMS was originally developed to have a super-cooled, super-conducting magnet system that would help capture the elusive cosmic rays. Since storage of cryogenic materials in space is an ongoing engineering challenge, the designers recognized that the AMS would have a finite lifetime as the cryogenic fluid boiled off. The magnetic strength of the cryogenically cooled magnet would be an advantage and allow bigger particle deflections and shorter measurement time in space. A weaker permanent magnet would allow for the same quality of data but would require longer time in space to reduce the measurement uncertainties. When the ISS lifetime was extended from 2015 to 2020, it was decided to use a permanent magnet. The AMS could now receive data for the life of the ISS and not the life of the cooling fluid.

Think about that—very close to launch, the team changed a fundamental part of the AMS design. And it worked—the AMS has recorded nearly 10 billion cosmic rays since its launch last May. As with many of the things we are doing on the ISS, the AMS has more than one application. The cosmic rays that it is using to find the missing dark matter are also of interest to teams planning human missions beyond low Earth orbit.

The radiation environment outside the Van Allen belts is not well understood, and observations taken by the AMS will help us develop countermeasures to keep far-flying astronauts safe and healthy. Magnets might play a role in radiation protection.

Vaccines, Zero "G," and Environmental Control

Of course, low Earth orbit presents its own unique challenges and opportunities for human health. Building on research conducted on the space shuttle in the 1980s and '90s, the National Laboratory Vaccine Survey has been conducting experiments on a number of pathogens for which there is no current vaccine.

It turns out that gene expression in microorganisms is very different in microgravity than it is in a one-g environment. By flying a series of human-infecting microbes in space, researchers have been able to get the space-grown bugs to become very much more virulent, possibly like they do once they infect humans. These virulent pathogens, in turn, can then be used to develop vaccines here on the ground. This is not theoretical. Researchers with a company called Astrogenetix currently have a vaccine under development for eventual human use. These are real diseases, and we are finding real potential cures. The first pathfinder was on Salmonella, a familiar food-borne illness. Salmonella sickens more than 1.4 million people and kills more than 400 every year in the United States alone.

More significantly, researchers also flew an experiment on MRSA—methicillin-resistant *Staphylococcus aureus*. Staph is a very common infection—the National Institutes of Health says that a quarter of us in this room have a staph infection right now, usually living harmlessly on our skin or in our nasal passages. Staph is the cause of many runny noses and sore throats every winter and can cause impetigo and arthritis if it gets under the skin.

Because it is so common, staph has developed resistance to most of the antibiotics used to treat it, up to and including methicillin, one of the nuclear weapons of the hospital arsenal. Methicillin-resistant staph can be fatal to otherwise healthy patients, and can be truly horrific to those it does not kill. Because it is so tough, it spreads throughout hospitals at an alarming rate. The Department of Defense even lists MRSA as an issue of concern to their medical community.[1]

Research in microgravity has now shown us a path to a vaccine for MRSA. Think about that. A real vaccine for a disease that, according to the CDC, infects 1.7 million and kills nearly 99,000 people in the United States every year.[2] There is every reason to believe we can use this technique to find vaccines for many more microbial illnesses. All viruses and bacteria show this same phenomenon. The potential is huge.

We have reached a level of maturity in space-based research where we are beginning to see some of the first real, predictable, and most importantly, tangible results for average people on the ground. In hindsight, we first saw evidence of this property of bacteria in space when we saw increased biofilm buildup in the water cooling lines of our space station. We need to stay really inquisitive to keep learning.

The important distinction here is, these are not spin-offs, like microprocessors or improved heat-resistant materials. Those are great, and we will continue to develop valuable spin-offs as we continue to explore. Here are results we can use to improve life on Earth that were developed using the unique laboratory of microgravity.

The University of Arizona does not want to simply exploit the properties that make viruses and bacteria become stronger in space; it wants to fundamentally understand why this occurs. This research might alter our basic understanding of viruses and bacteria. It could even allow this phenomenon to be exploited on the earth without the need to travel to space.

The space shuttle paved the way for this, and the ISS is now beginning to show the real results. Basic research and development takes time, of course, but we have already done much of the basic R&D. The vaccine development built on prototypes flown for years on the space shuttle—we launched the Salmonella and MRSA experiments with credible evidence that we could produce results. It was not a shot in the dark.

The Alpha Magnetic Spectrometer had also proved its worth on its shuttle flight, which gave credibility to the idea of developing a larger, long-term experiment. The AMS we launched to the space station is actually so sensitive it actually started recording data when we turned it on at Kennedy Space Center. Now it is using 300,000 data channels to record a gigabyte a second, 24 hours a day, year-round, in space.

These focused R&D projects are producing results. Researchers in Japan running protein crystal growth experiments have found a possible path to a treatment for Duchenne's muscular dystrophy, as well as other viruses.

Apple Computers purchased the rights to a material being marketed as Liquidmetal, which has the strength of titanium and the plasticity of, well, plastic. It too was first developed as part of a materials experiment in zero-g.

Of course, the very environment we are working in forces us to continue to innovate new and better ways of simply staying alive. The ISS is not only a great laboratory for developing new drug treatments, materials

research, and answers to life, the universe, and everything else; it is also a perfect laboratory for extending our reach into the solar system. Any physical science with a "g" gravity term in its equation can benefit from testing with the "g" removed.

The environmental control system onboard, what we call REGEN-ECLSS, recycles upwards of 80 percent of the water used by the crew. Water, unlike oxygen or other gasses, is incompressible, meaning that a gallon of water launched into space takes up just as much room on a supply ship as a gallon of water in your car. Recycling all of the crew's exhaled moisture, dampness from exercise and bathing towels, and urine dramatically reduces the amount of liquid we need to launch into space and dramatically increases the amount of room we have for other cargo.

Not only that, the water we have up there can be used to generate oxygen, which can then be turned into carbon dioxide by the crew, which we can then separate into carbon and oxygen, which we can then combine with waste hydrogen from the oxygen-generating process to form water again.

The rich tapestry that is our oxygen and water system has not been easy, of course. The first period of operations of the urine processing system were plagued by jammed filters and clogged pumps. It took us a while to figure out why. It is well known by now that human bones leach calcium at a high rate in zero-g. It is the healthy astronaut equivalent of osteoporosis. This is a major area of investigation for our human research program, because upon return to Earth, astronauts regenerate this lost bone structure, unlike your 80-year-old grandmother. We do not yet know why they can grow this bone back.

Unfortunately, while they are losing all of their calcium on-orbit, it had to go somewhere, and it went straight into the filters of the water system. While some calcium buildup had been anticipated in the design, our engineers had not accounted for just how much would end up there.

We redesigned the pump, and since the ISS is only a two-day trip away by rocket, we were able to replace the original design and bring the capacity of the water system back to normal. The crew and their station are becoming one system.

The benefits here are twofold, and from two very different disciplines. First, our engineers learned a lesson about designing water recovery systems at a relatively low cost and low impact to the mission. There are many things we design that simply work differently in space that we cannot

anticipate on the ground. Fortunately, this one happened close to Earth, which is one of the primary benefits of having the ISS as a test bed.

Secondly, our human medical researchers were able to better quantify the calcium loss thanks to returned samples. They are working on different countermeasures, including diet and exercise, to minimize the amount of calcium loss on-orbit.

As has been said about airplane radar and convection ovens, these two disciplines did not know how much they had to learn from each other. Their intersection gave us the microwave oven. Our functioning home in space has brought two new disciplines together. Courage, my friends, we are advancing to the Brick Moon!

ISS Control, Launch, and Communications

Assembling the ISS in space has almost been the easy part. As you know, the ISS partnership is made up of five space agencies and 15 countries, bound together by treaty-level governmental agreements negotiated almost 20 years ago. The challenges involved in this effort have at times seemed insurmountable, yet we have somehow always overcome. Think about it—Tokyo is a 14-hour flight and 14 time zones behind Washington, DC. Moscow is a 12-hour flight and eight time zones ahead of Washington. Paris is a 7-hour flight and six hours ahead. Even Montreal is still a two-hour airplane ride from Washington. And that is only the NASA-centric view; Tokyo is still a long ride from Moscow, and so on.

That does not begin to address the language barriers we have all faced, or even simply the cultural differences between our five partners. As a young engineer in Ohio, I do not think I ever expected one day to be fully comfortable traveling from Kazakhstan to Moscow to Tokyo in a single trip, but I have done exactly that. The cultural awareness and cultural changes were far greater than the physical travel.

We have learned that we are not nearly as different as it would have appeared in 1993, or even 2003. The biggest evidence of this is orbiting over our heads as we speak. All of those parts we built—all of the laboratories, connecting modules, logistics modules, trusses, solar arrays—all of them fit together on the first try, just like they were designed. That first try, of course, happened in space. I sometimes worry that we do not appreciate quite enough what an achievement that really is.

The Great Pyramid of Giza took an estimated 20 years to build. Notre Dame Cathedral in Paris took more than 150 years. The space station is perhaps the single most complicated engineering project ever undertaken by humanity, and we did it in 13 years of actual assembly in space, with every major part working as designed. Actually, the more I reflect on it, the more I think the engineering was actually the easy part. We have five partners—that is five governments, really 15 if you count all of the European Space Agency partners—that all have to agree on a plan and a budget and a schedule. As we have seen in the United States alone this year, even getting a single country's government to agree is no easy task. Yet, through the dedication of everyone in the program in every agency, and in part to what I like to think of as the singleness of our mission, we managed. All of our governments agreed this space station was worth their time and treasure and endless meetings and negotiations. The methods we have developed for managing the ISS, I believe, are a model for future large international science and engineering collaborations. It took years for us to get a system in place to manage this vehicle and its fleet of support ships that are coming and going, on average, once every three weeks.

Twice a week, we conduct the International Mission Management Team meeting. This is a telephone conference run by our working-level people from each agency where they discuss their tactical strategy for managing daily operations. Once every few months, we have a Space Station Control Board meeting, which is where the ISS program managers get together, usually in a video call, to discuss their medium-term tactical and strategic management strategy. A few times a year, we have a Multilateral Coordination Board meeting, which is chaired by my counterparts and me, usually in person, where we discuss our long-term strategic plans for ISS.

I detail all these meetings to emphasize that the way we manage the station, and in my opinion the only way to manage it, is by communication. It is all about communication. Communication between the partners is most critical; it is more important than any single launch, any single module, and any single spacewalk. Without daily communications between each partner, we simply would not be able to execute this program.

Let me make clear to anyone who might someday manage our next big international mission, maybe to the moon, maybe to Mars—communication is the most important part of your program. From this communication comes trust—and there must be a level of trust. We cannot fully understand the details of another partner's design. At some point we must trust

that they have fully worked the design and its operation and understand how it will work with the ISS.

Challenges in Space and on the Ground

This type of communication has helped us overcome the many challenges we have faced in assembling the ISS. I would like to mention a few of these challenges now, because they help inform the way we will manage the program in the future.

This may shock you, but budget is actually not one of our biggest challenges right now, at least for the space station program. It could be, if the Washington budget folks listen to this speech and hear me say budget is not a problem. They would see this as an opportunity to cut our budget. They also want more return for each dollar spent.

We have spent enough time working with the Congress and helping them understand the program that we have actually gotten to the point where we, and more importantly, they, understand what we need to fund our O&M costs reliably.

More is almost always better, of course, and a more robust budget would enable us to fund a more robust research program. The research funding could be increased and is very small compared to the assembly and operations costs. However, with our National Lab partners, we have been able to develop a plan that helps spread research costs around while maintaining a reasonable utilization schedule.

Keep in mind, I am only talking about the budget for operating the station. Our next biggest challenge is transportation, which is both a technical and budgetary challenge. As you all know, since we retired the space shuttle, our only access to the crew has been through the Russian *Soyuz*. I would also like to clarify something the media has yet to get right. They like to point out that since we do not have the shuttle, we are now solely reliant upon the Russians. This is true, but it misses the point. We have always been solely reliant upon the Russians for crew transportation. Emergency return capability on station has always been via the *Soyuz*. Even when we rotated crews with the shuttle, they had a seat on the docked *Soyuz* in case of an emergency. We actually had not even rotated a crew on the shuttle for the last few years of the program.

So from this perspective, the new world is the same as the old world. However, it does put us in a more precarious position politically. The Russians

have had a trying year, experiencing several launch failures, including one cargo ship which was bound for the ISS. I consider the Russians among the world's foremost rocket engineers, and while the *Soyuz* capsule has only flown 123 times, the *Soyuz* rocket has flown more than 1,800 times in its various iterations. To say once more, 1,800 times. That is a lot of flight history in a rocket design, to be sure.

I have confidence in our Russian partners to find and correct the problems they seem to have been having lately, and I am comfortable continuing to launch our crews aboard their vehicles for as long as we need to. However, additional redundancy would be nice.

Commercial Partnerships

One of our guiding principles on the ISS is the concept of dissimilar redundancy. We have a lot of duplication on-orbit—two oxygen generators, two carbon dioxide removal systems, a whole fleet of different cargo delivery ships, all of which provide the same function in different ways, so that no single failure or design flaw can affect the others.

Right now we are violating this principle of dissimilar redundancy by having only one way to launch crews into space. The *Columbia* tragedy showed us the value of redundancy. Our Russian partners understand this as much as we do.

This is a transitional time for NASA as we watch commercial cargo come on line. SpaceX is hoping for their first rendezvous and docking with the ISS next month, and Orbital should launch their cargo ship later this year. We have a cargo margin already onboard the ISS, which means we do not require the immediate success of these companies. Three current cargo ships, the *Progress*, the H-II Transfer Vehicle (HTV), and the Automated Transfer Vehicle (ATV), are sufficient for now to give our new commercial partners time to grow. The upcoming launches this year are test flights, and I want to stress that. These companies will be operating where historically only governments have, and I think it will be interesting to watch.

We are trying to continue this effort with our commercial crew program at NASA. We have selected a number of partners for this program, and by providing limited funding, we are hoping to accelerate their development of private space vehicles that can take crew to and from orbit.

This is another one of our challenges. The more budget we have to help these partners, the sooner we can help them begin flying safely and reliably. Once they begin flying safely and reliably, we will be back to our core principle of dissimilar redundancy for access to station.

Another challenge we face is the utilization of the ISS. This year we selected the Center for the Advancement of Science in Space, or CASIS, to manage the US portion of the ISS as a national laboratory. This is one of the most important research developments of the past few years. While NASA will continue to do the kinds of research that are directly relevant to us—like long-duration human exposure to microgravity and long-duration systems development—we simply cannot use all of the facilities of the ISS. It is too big.

Instead, we have selected an outside partner to act as the referee to figure out how best to use the vast capacity of the station. The vaccines I talked about earlier were developed in this way—by an outside entity partnering with NASA. In the future, exactly this kind of research will continue, but it will be managed through CASIS.

The NASA-CASIS interfaces are still being worked out, which is why I list this among our challenges. Getting the word out to the research community of this incredible resource is another one of our challenges, one that I look forward to working with CASIS to address. In the future, I expect one of our challenges will be figuring out how to down-select from the many research proposals we receive.

The goal of CASIS is to show typically nonspace commercial companies the advantages of using the space station as a research environment. Any equation with "g" in it can gain additional insight into the process represented by the equation by going into microgravity. New insight into combustion can be done in the combustion research rack on the ISS. CASIS is to expose the commercial sector to the advantages of space-based research to their industry. Space could become a new economic engine for this nation.

Finally, figuring out what to do with the ISS for our own uses is the last of our biggest challenges. We have a tacit agreement among the ISS partners that our next step is to move humans out into the solar system. However, we all recognize that we simply cannot do this in a safe and effective way without developing on station the systems that will take us there. It is a lot easier to troubleshoot a faulty oxygen generator two hours from home than it is two months from home.

The problem here, as the problem is everywhere else, is one of resources. This year, at our Multilateral Coordination Board meetings and possibly at a meeting of the heads of all the space agencies, we are hoping to establish a well-thought-out plan of research and development to begin to take us there. Technology development is critical to these efforts, and it will be better for all of us if we attack this as a unified partnership rather than as a loose confederation.

Another one of the topics we will be discussing is the best way to use the actual station components to support research. We have been floating some ideas about possibly using station modules that are on-orbit to support a new exploration vehicle—literally disassembling a few pieces of the space station, putting them together in a new configuration, and blasting them right out of the current orbit.

As odd as it seems to start talking about taking the thing apart right after we finished putting it together, the actual missions will not happen for years yet, but the planning needs to begin now. Our entire experience on station has shown us that our estimates on the life of nearly every component have been very conservative. The vehicle is outperforming anything we could have hoped for, and it would be foolish of us to not plan to use it to its fullest. Courage, my friends, we are advancing to the Brick Moon!

Exploring Space—the Final Frontier

In 1804, Pres. Thomas Jefferson commissioned an expedition to find a navigable water route to the other side of North America—the fabled Northwest Passage. Meriwether Lewis and William Clark were selected to lead the expedition. Lewis, Clark, and their team left the East Coast in 1804, bound for points west. Along the way they discovered a wealth of knowledge that had great value scientifically, commercially, and politically, though they never did find the Northwest Passage.

Jefferson originally requested $2,500 from Congress for the expedition. The final cost of the trip was closer to $50,000. History has certainly shown that the investment was worthwhile. The Lewis and Clark expedition nearly single-handedly opened the American West for expansion, which was one of the primary economic engines that drove the United States for nearly 150 years.

Think ISS. . . .

In 1838, the US government sponsored a round-the-world trip of six ships, called the US Exploring Expedition [Ex-Ex]. It was the first government-sponsored nautical journey and consumed somewhere between one-quarter and one-third of the federal budget. Think about that—a third of the federal budget. This was before the rise of most of the government services we take for granted today, but that is still an enormous commitment to exploration and discovery on the part of the Congress.

The US Ex-Ex charted much of the Pacific Ocean, as well as large parts of the coast of Antarctica. It brought back tens of thousands of plant and animal specimens, which in large part convinced Congress to fully back the founding and funding of the Smithsonian Institution to categorize and preserve them. Some of the charts created by the Ex-Ex were still in use a hundred years later in the Pacific Theater in World War II. Is exploration worth the cost?

In 1919, a hotel owner named Raymond Orteig offered the princely sum of $25,000 to the first airplane to fly nonstop between New York and Paris. Eight years later, it was claimed by Charles Lindbergh in one of aviation's greatest triumphs.

I bring this all up to illustrate a point. In our business, we like to say that we are going places and doing things that no one has ever done before. This is true. However, it is also important for us to remember that we are the latest in a long line of explorers, scientists, engineers, and entrepreneurs that stretches back hundreds of years. We are not different; we are merely continuing the work they began.

The US government has historically funded bold and expensive exploration and research programs. Thomas Jefferson originally proposed a Lewis and Clark–type expedition in the 1780s—before the signing of the Constitution. The US Ex-Ex was primarily a trip to show the flag around the world and conduct science if possible. The scientific returns were immeasurable.

The Orteig prize had a modern parallel in the X-Prize, which was directly modeled after the success of the transatlantic flight. The X-Prize was even claimed eight years after it was announced—the same amount of time as the Orteig prize.

What we do is what we have always done, and hopefully what we will always continue to do: explore. The work on the International Space Station is helping to find new vaccines, new materials, and new ways of looking at our home planet that will directly affect the lives of millions on the ground. These are not spin-offs. These are direct results of focused research

that is building on decades of experience working in space. Thirty-one countries are currently conducting investigations onboard, representing hundreds of researchers. This is the way humanity conducts serious space exploration.

At the same time, the ISS is helping us fill in the blanks on the specific ways humanity will finally leave the confines of low Earth orbit in a sustainable, robust way. When the crew of some future starship *Enterprise* looks back at the history that got them their ship, I believe they will see our work today in the same way we see Lindbergh, Lewis, Clark, and even Columbus—as foolhardy, fragile, brave, audacious, and utterly necessary.

Günter Wendt called this the "unbroken chain," and we are doing our part to ensure that we are a link in the middle, and not the bitter end.

Courage, my friends, we are advancing to the Brick Moon! **SSQ**

Notes

1. "Preventing and Controlling MRSA Infections in the Military Health Care Setting," *Force Health Protection and Readiness*, 29 December 2010, http://fhp.osd.mil/new.jsp?newsID=20.

2. R. Monina Klevens, DDS, MPH; Jonathan R. Edwards, MS; Chesley L. Richards Jr., MD, MPH; Teresa C. Horan, MPH; Robert P. Gaynes, MD; Daniel A. Pollock, MD; and Denise M. Cardo, MD, "Estimating Health Care-Associated Infections and Deaths in U.S. Hospitals, 2002," *Public Health Reports* 122, no. 2 (March–April 2007): 160–66, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1820440/?tool=pmcentrez.

Chasing Its Tail

Nuclear Deterrence in the Information Age

Stephen J. Cimbala

Twenty-first-century nuclear arms control and deterrence will take place in a technology context that privileges the smaller, the faster, and the more agile over the larger, the slower, and the less adaptive. At the high end of conventional deterrence and war-fighting capabilities are included long-range conventional precision strike, advanced C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance), network-centric warfare, and the forward movement, at uncertain paces, of defense-related nanotechnology and artificial intelligence.[1] Meanwhile, nuclear weapons remain in the arsenals of leading powers and in the aspirational tool kits of putative regional hegemons or potentially disruptive rogue states.

This present and emerging context for nuclear arms control and deterrence leads into politico-military conundrums and paradoxes. First, cyber war and nuclear deterrence may emerge as overlapping jurisdictions, bringing new complexity into the fabric of US and other military-strategic planning. Second, antimissile defenses based partly on new technologies may finally challenge the hitherto supreme status of offensive nuclear launchers. If so, then a third outcome is possible. Instead of the venerable Cold War–era triad of intercontinental land- and sea-based missiles and bombers or the post–Cold War triad of nuclear and conventional offensive forces, defenses, and supporting infrastructure, a new "triad" of cyber strategy, minimum nuclear deterrence, and antimissile defenses might merit further descriptive attention from strategic thinkers and policymakers.

Cyber and Info Wars: Concepts Aplenty

Academic and professional literature and US government agencies already offer a rich menu of definitions for important cyber-related concepts, including cyberspace and cyber power.[2] The Department of Defense's first formal cyber strategy, released in July 2011, anticipated that some attacks on US information systems would meet traditional definitions of war, perhaps justifying retaliatory responses that were either cyber, or kinetic, or both.[3] *Information warfare* can be defined as activities by a state or nonstate actor to exploit the content or processing of information to its advantage in time of peace, crisis, or war and to deny potential or actual foes the ability to exploit the same means against it. This is an expansive, and permissive, definition, although it has an inescapable bias toward military and security-related issues.[4] Information warfare can include both *cyber war* and *net war*.[5]

The related concept of *cyber deterrence* involves degrees of uncertainty and complexity that require a leap of analytic faith beyond what we know, or think we know, about conventional or nuclear deterrence.[6] Cyber attacks generally obscure the identity of the attackers, can be initiated from outside of or within the defender's state territory, are frequently transmitted through third parties without their complicity or knowledge, and can sometimes be repeated almost indefinitely by skilled attackers, even against agile defenders. On the other hand, systems are vulnerable only to the extent that they have flaws unknown to the defenders that can actually be exploited by attackers. In addition, the impact of any cyber strike is relative to the time needed to recover the attacked system—of which neither attacker nor defender would have preattack knowledge.[7] For these and other reasons, the contrast between the principles of cyber deterrence and nuclear deterrence encourages modesty in the transfer of principles from the latter to the former. As Martin Libicki summarizes,

> In the Cold War nuclear realm, attribution of attack was not a problem; the prospect of battle damage was clear; the 1,000th bomb could be as powerful as the first; counterforce was possible; there were no third parties to worry about; private firms were not expected to defend themselves; any hostile nuclear use crossed an acknowledged threshold; no higher levels of war existed; and both sides always had a lot to lose.[8]

Airpower theorist Benjamin S. Lambeth regards cyberspace as part of the third dimension of warfare that also includes air and space operations. Cyberspace, according to Lambeth, is the "principal domain" in which

US air services "exercise their command, control, communications, and ISR (intelligence, surveillance, and reconnaissance) capabilities that enable global mobility and rapid long-range strike."[9] In addition, US dominance—or falling behind—in cyberspace has repercussions for the nation's success or failure in aerospace and other domains of conflict.[10] Lambeth's effort to conceptualize cyber power or cyber war in a larger context is supported by Colin S. Gray, who cautions against over-mystification of the problem of cyber strategy:

> When you use the term *cyber strategy* you risk misleading people into thinking that they are entering a new and mysterious domain. Happily, we know a great deal about strategy. We should, with 2,500 years of past experience from which to learn. And we have readily to hand a good enough general theory of strategy that certainly has authority over cyber power.[11]

Attacking in the Cyber Realm

Experts foresee that some kinds of cyber war will be part of many future military conflicts.[12] But the term *cyber war* may be misleading, since attacks on computers and networks are only one means of accomplishing the critical objective of neutralizing an enemy's critical infrastructures.[13] The purpose of information and infrastructure operations (I2O) would not be mass *destruction* (although destructive secondary effects are possible), but both mass and precision *disruption*. According to some scholars, the purpose of an information and infrastructure operation would be to "disrupt, confuse, demoralize, distract, and ultimately diminish the capability of the other side."[14] This concept lends itself to candidate consideration for a nuclear responsive deterrent mission.

Under the assumption of future Russian and US strategic nuclear forces limited to 1,000 or so deployed offensive weapons with operational performance parameters comparable to present systems, each side would reasonably expect to retain some hundreds of second-strike survivable and retaliating weapons. Allocating these weapons to targets requires parsimonious retailing of weapons against targets (unlike the wholesale overkill of the high Cold War). Fighting a counterforce war against the other side's remaining nuclear forces would rapidly deplete a force already challenged to maintain any capacity for escalation control and war termination, or for continued postwar nuclear power status. Blowing up the cities of the other side is easily accomplished but not necessarily empowering of

strategic aim or military objective. It makes sense only as an option withheld for possible future use to deter the adversary from taking a similar step.

Instead of Cold War–style counterforce or countervalue targeting (the former futile, and the latter gratuitously inhumane), US and Russian plans for retaliation might emphasize counter–information and infrastructure strikes. The cyber and industrial recuperative capabilities of a state, including electricity, transportation, refineries, depots, and military-supporting industries—together with partial disruption of warning, command-control-communications, and reconnaissance capabilities—could paralyze decision making and limit military options. Although civilian casualties would be unavoidable from widespread I2O attacks, they would not be the object. Information-infrastructure targeting could threaten to inflict decisive paralysis on the opponent's military information systems or civil infrastructure with minimal physical damage, provided an imaginative cyber component survived the other side's attack. Instead of a second-strike capability for mass destruction, an I2O-focused minimum deterrent would pose the credible threat of focused and mass disruption.[15]

One can imagine three objections to the preceding suggestions. First, increasing capabilities for I2O strikes might raise the appeal of preemption for a state. As opposed to riding out an attack and retaliating, a state might be so fearful of its cyber vulnerability that it would prefer to wager on anticipatory attacks (preemptive or preventive) instead of responsive ones. This concern is not unreasonable, especially since the identity of a cyber attacker is easier to conceal than that of a kinetic first striker. A second objection to I2O targeting for nuclear retaliatory forces is that it might not be scary enough to dissuade determined attackers. Only assured destruction of the opposed regime or its society as a functioning entity would assuredly deter in this view. However, even during the Cold War, "assured destruction" represented a mistaken view of leaders' actual decision matrices (John F. Kennedy's national security advisor McGeorge Bundy had the last word on this, with his equation of 10 nuclear weapons on 10 cities as a "disaster beyond history"). During the Cuban missile crisis of 1962, for example, the ExComm advisory group to President Kennedy was most anxious to avoid a war, regardless of the putative pre-war US nuclear superiority in the numbers of deployed and second-strike-survivable strategic nuclear weapons.

A third objection to an I2O-oriented second-strike capability as the basis for US-Russian nuclear deterrence is that the conditions and expectations for terminating a cyber war or a cyber component of a larger war are not well understood compared to more conventional or predigital conflicts. One aspect of this inscrutability for cyber conflicts has already been noted: the identity of the first striker or "perpetrator" might be unknown and undetectable within the time available for deciding upon retaliatory options. Another aspect is that nuclear destruction might remove reliable means of communication, including power grids, satellite links, and underground cables, between adversaries otherwise intending to negotiate for war termination. This third objection also includes the possibility that obscured identities and mistaken perceptions by one or both sides could be exploited by third parties or additional troublemakers who took the opportunity to scavenge while vultures fought over their respective carcasses.

The objections relevant to any war with a heavy cyber component suggest that a nuclear deterrent based mainly on I2O retaliation should leave the door open for the inclusion of conventional long-range weapons (so-called PGS, or precision global strike weapons) in the responsive repertoire. Russia's aversion to US prompt global strike systems is well known, based on the Russian military's fear of US conventional deep-strike capabilities in the European theater of operations and globally. Russia's wariness on this score reverts to its analysis of the US air-ground campaign against Iraq in 1991, especially the 37-day air war. Russia's post–Cold War inferiority to NATO in conventional military capabilities, together with its allergy to NATO enlargement, creates for US and NATO–mistrusting Russians a picture of a conventional theater-strategic NATO option for a twenty-first-century Barbarossa. Even short of war, NATO enlargement and conventional deep strike, supported by US global supremacy in C4ISR and prompt global strike systems, could deter Russia from using the threat of force against former Soviet states now inside, or aspiring to join, NATO.

Granted Russia's pessimism on this score, the United States may nevertheless choose to equip itself with retaliatory options of global reach and using conventional weapons. Launchers specifically dedicated for this mission, together with long-range and airborne hypersonic technology vehicles (HTV), could be included in any future war plan that seeks to accomplish national objectives with minimum collateral damage.[16] The airborne element might eventually include purpose-built remotely piloted aircraft or technologically enhanced space planes. Russia's objection, that it might

confuse the launch of a conventional PGS system with the firing of a US nuclear first strike, can be met by verifiable separation of PGS-capable and nuclear-tasked launch vehicles. As part of any US strategic retaliatory force, conventional PGS systems could deliver electromagnetic-pulse weapons, microwaves, or other devices to cripple the effectiveness of enemy computers, electronics, and other cyber assets. Conventional PGS systems, in addition to their roles in any strategic retaliatory force, could be used preemptively against terrorist storage bunkers (including bunkers storing weapons of mass destruction).

Cyber weapons used prior to or during a nuclear attack, or even during a nuclear crisis, might qualify as conventional or unconventional, depending on taste. It would be a stretch to refer to them as nuclear or even as weapons of mass destruction (although, as already argued, not as weapons of mass disruption). The issue of whether to incorporate cyber or information weapons into standing targeting plans involves complexities not addressed here. The most effective exploitation of cyber or information weapons depends on their flexibility and capacity for turning on a dime relative to the opponent's ability to complete its decision loop. On the other hand, one can imagine cyber weapons as part of preplanned attacks: viruses, Trojan horses, worms, and other corrupters of the integrity of opponents' software systems could be planted months or years in advance of expected conflicts. Perhaps in acknowledgment of the risks of cyber dependency or digital fixation, the US Army now conducts some training exercises where units are required to turn off some of their Force XXI battle command-control systems—both to ascertain how well the troops do without them and to train troops for information-deficient environments in battle.[17]

Ongoing cyber attacks in peacetime to test the resiliency of competitors' safeguards have become so routine that indignation is rare and reportage long ago lost any "gee whiz" overtones. For example, the most remarkable aspect of the reported attacks on Iran's nuclear infrastructure by the Stuxnet worm, widely attributed to Israel and/or the United States, might be the relatively low-key manner with which the regime in Tehran reported the episode and downplayed its significance. Stuxnet raises the possibility of a growth industry for researchers in the use of cyber weapons for counterproliferation, with the attendant difficulties of source identification and acknowledgment.[18]

Assured Retaliation

Suppose, for the sake of argument, that the abstract notion of basing a minimum US or Russian strategic nuclear deterrent on I2O targeting found resonance among defense planners in both states. Could it be implemented with forces at or below 1,000 operationally deployed long-range nuclear weapons? The following analysis interrogates that issue in several stages. First, we analyze hypothetical post–New START Russian and US strategic nuclear forces for their ability to provide for assured second-strike retaliation.[19] Second, we ask whether the deployment of antimissile defenses by either or both states would preclude the effectiveness of minimum deterrence, regardless the targeting emphasis of retaliatory forces on I2O or otherwise.[20] Third, we interrogate the model for insight into possibly combined effects of cyber and kinetic strikes.

Figure 1 summarizes the estimated numbers of surviving and retaliating second-strike warheads for US and Russian strategic nuclear forces under a deployment limit of 1,000 weapons. Each state deploys a balanced triad of launchers. The numbers of second-strike surviving and retaliating warheads are tabulated under four conditions of alertness and launch doctrine: (1) generated alert and launch on warning (Gen/LOW), (2) generated alert and riding out the attack (Gen/RO), (3) day-to-day alert and launch on warning (Day/LOW), and (4) day-to-day alert and riding out the attack (Day/RO).

	Rus Gen/LOW	Rus Gen/RO	Rus Day/LOW	Rus Day/RO		U.S. Gen/LOW	U.S. Gen/RO	U.S. Day/LOW	U.S. Day/RO
Series1	438.73	365.61	292.49	219.37		442.03	368.36	294.69	221.02
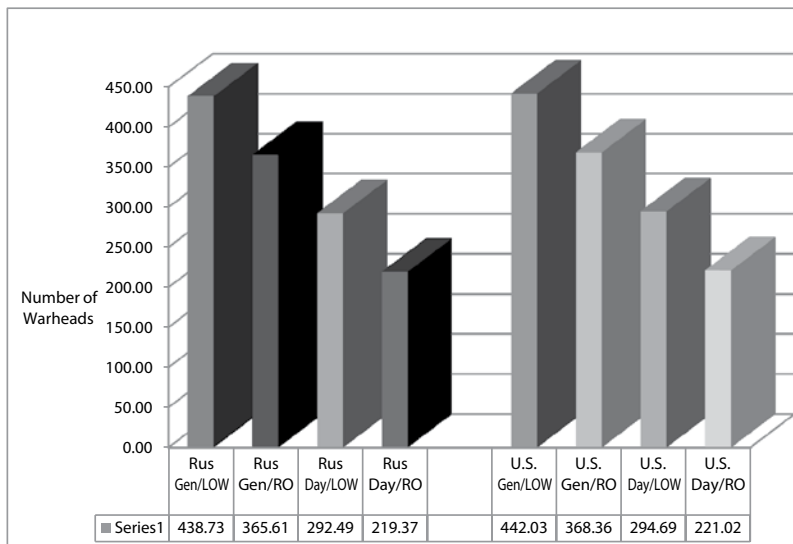
Figure 1. US-Russia surviving and retaliating warheads (1,000-deployment limit)
(*Source*: Figures 1–6 are based on a model originally developed by James J. Tritten and subsequently modified by the author. Dr. Tritten is not responsible for its use here nor for any arguments or conclusions.)

Figure 2 replicates the analysis summarized in figure 1 but with a smaller maximum number of 500 deployed long-range weapons for each state.

The results displayed in figures 1 and 2 suggest that Russia and the United States could provide for stable deterrence based on assured second-strike retaliation with numbers of deployed weapons significantly lower than those provided for in New START (or, conceivably, could not, if political relations soured and expectations of "reset" and rapprochement were replaced by expectations of a renewed nuclear arms race—politics rules!). In the present illustrations, under a deployment limit of 1,000 or 500 weapons for each state, either a balanced triad of launchers or hypothetical alternatives (interesting in case of lags in modernization, especially for Russia) provide from hundreds to many tens of thousands of surviving and retaliating weapons under every condition of alertness and launch doctrine. Although leaders in the United States and in Russia have presently ruled out any departure from triads of intercontinental launchers, future exigencies or attractive technologies might change this calculation.

	Rus Gen/LOW	Rus Gen/RO	Rus Day/LOW	Rus Day/RO		U.S. Gen/LOW	U.S. Gen/RO	U.S. Day/LOW	U.S. Day/RO
Series1	229.16	190.97	152.77	114.58		238.92	199.10	159.28	119.46
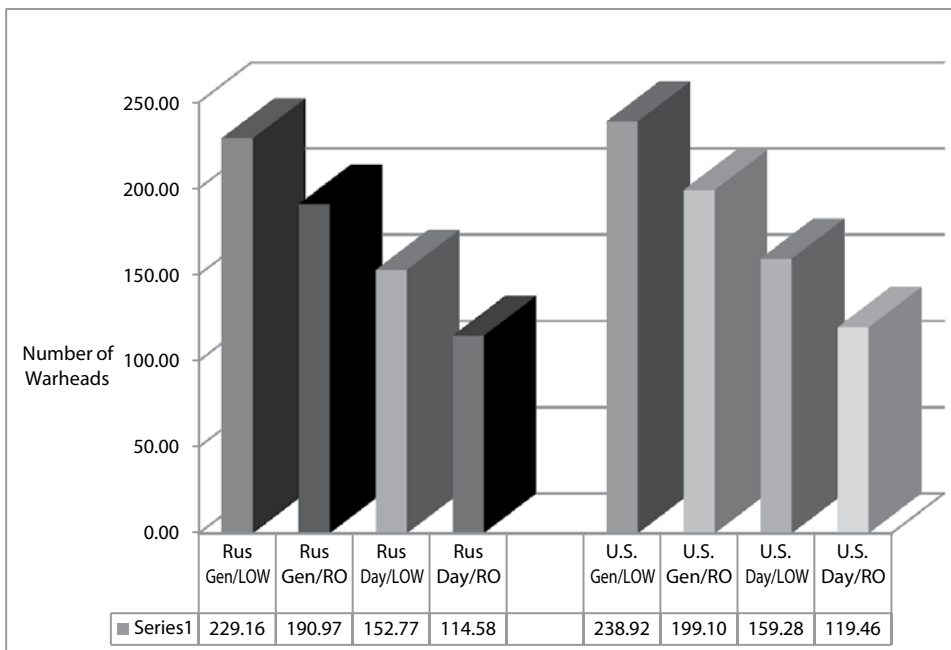
Figure 2. US-Russia surviving and retaliating warheads (500-deployment limit)

Missile Defenses

Would missile defenses complement or conflict with the objective of minimum deterrence through reductions in offensive nuclear forces, including the option of increased emphasis on I2O targeting? In figures 3 and 4, US and Russian second-strike retaliatory forces are opposed by missile and air defenses with drawdown curves of effectiveness against penetrating ballistic missiles and aircraft-delivered weapons from 20 to 80 percent. The upper tier of defenses in this graphic provide an optimistic performance expectation for missile and antiair defenses judging by today's standards, but it allows room for improvements in ballistic missile defense (BMD) performance that might materialize between now and 2018–2020 (the New START due date for implementation of treaty reductions and the final stage of planned European phased adaptive approach [EPAA] missile defense deployments). Figures 3 and 4 summarize the numbers of second-strike surviving and retaliating warheads for each state under the initial deployment limits of 1,000 weapons and 500 weapons, respectively. For the sake of consistency, all retaliatory forces are operating under conditions of generated alert and riding out the attack (Gen/RO), and both sides are deploying triads.

	Phase IV U.S. Defenses	Phase III U.S. Defenses	Phase II U.S. Defenses	Phase I U.S. Defenses		Phase IV Russian Defenses	Phase III Russian Defenses	Phase II Russian Defenses	Phase I Russian Defenses
▪ Series1	73.12	146.24	219.37	292.49		73.67	147.34	221.02	294.69
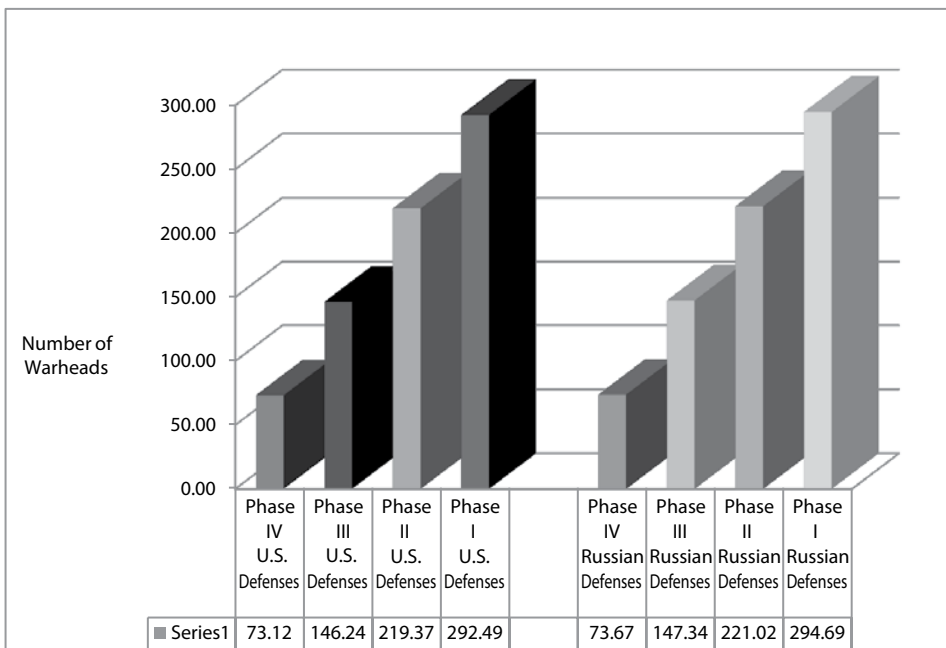
Figure 3. US-Russia surviving and retaliating warheads vs. defenses (1,000-deployment limit)
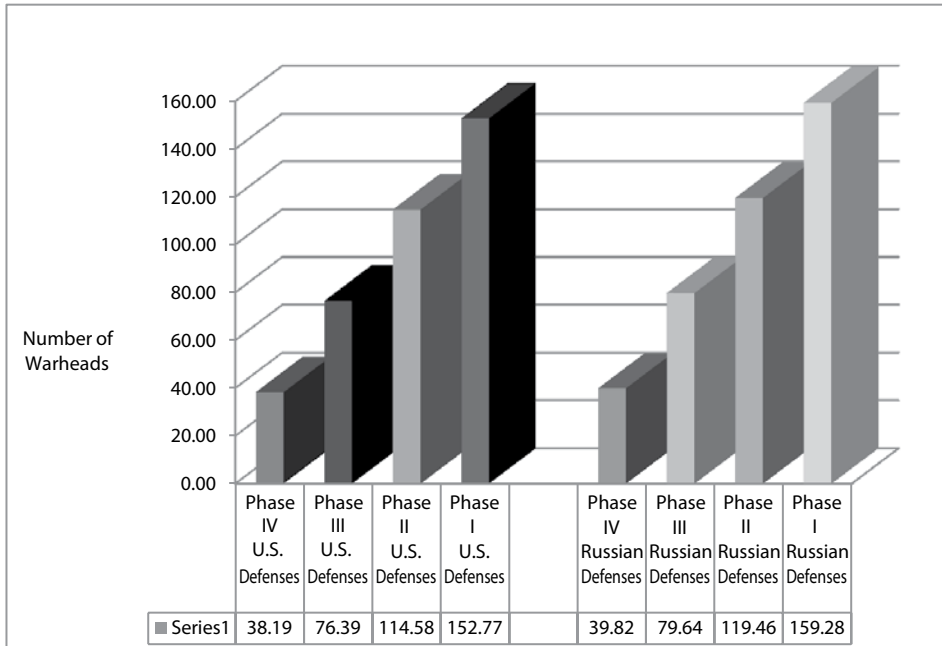
Figure 4. US-Russia surviving and retaliating warheads vs. defenses (500-deployment limit)

The results summarized in figures 3 and 4 offer mixed messages for US and Russian military planners and for students of nuclear arms control. On one hand, post–New START nuclear retaliatory forces, even at minimum deterrent levels, can conceivably provide for numbers of surviving and defense-penetrating warheads adequate to support a strategy of stable deterrence. On the other hand, as deployed defenses gradually improve, they make it harder to build flexibility into retaliatory targeting options. Deploying defenses that are *too* capable against either side's nuclear retaliatory forces could drive military planners into launch-on-warning doctrines, increased expenditures on offensive countermeasures to defenses, or additional deployments of offensive weapons.[21]

Even technically improved antimissile defenses relative to offenses leave open ended the strategic and political priorities that will determine future US and Russian defense modernization. Opportunities exist for misunderstanding and misperception, creating further distance between the security agendas of Washington/Brussels and Moscow and postponing the extension of the European security community eastward to include Russia as a participant and not just as an observer.[22] Russian political leaders and technical experts argue the case for participation with NATO in a European-

wide missile defense system, even as they warn of a European BMD danger to Russia's deterrent *and* advocate deployment of new offensive land- and sea-based missiles equipped to defeat such antimissile systems.[23] The Obama "reset" with Russia is also under siege in US domestic politics, adding to uncertainty with respect to future US-Russian security cooperation or lack thereof.[24]

US and Russian arms controllers who are attempting to detoxify the potential conflict between further offensive force reductions and missile defenses might be fighting the wrong corner. An information-infrastructure deterrent might rely less on antimissile or air defenses—or countermeasures to those defenses—than traditional models based solely on kinetic factors would suggest. Instead, an I2O first- or second-strike force might exploit the electronic spectrum and the information grid of its opponent for disruption that swept around, over, and under the sensor and shooter exchanges previously thought of as dispositive.[25] Related to this possibility, Russia's war against Georgia in August 2008 demonstrated how cyber war and information operations might be used in support of conventional military operations. The Russian cyber campaign reportedly attacked some 38 Georgian and Western websites upon the outbreak of war, including ranking Georgian government offices and the US and British embassies in Georgia, and appeared to be centrally directed and coordinated with the tempo of force operations.[26]

Instead of a single integrated operational plan (SIOP), however flexible, for fighting a nuclear war if deterrence failed, planners would have to devise a matrix of plans linking information strike with kinetic options. How complicated this might be is probably beyond the power of mere mortals to demonstrate with any proficiency—much is speculative as to the two-way complexity of combined cyber and nuclear or conventional kinetic attacks. On the other hand, analysts and planners must do what they can in the face of questions and demands for performance that will not go away.

A simplified approach to one aspect of a cyber-soaked SIOP might be illustrated as follows. Let us assume that both the United States and Russia were required to carry out second-strike retaliation after having absorbed both cyber and kinetic first strikes. To measure the impact of such strikes, we estimate that the cyber component directly or indirectly neutralizes as many surviving and retaliating weapons as does the kinetic portion. The second-strike surviving forces would therefore be in a position equivalent to

that of a third striker in a series of exchanges without information weapons. In effect, they would be fighting World War III-b. The additive effects of both cyber and kinetic strikes are summarized in figures 5 and 6 representing the 1,000- and 500-weapon prewar deployment limit (without defenses), respectively.

	Rus Gen/LOW	Rus Gen/RO	Rus Gen/LOW	Rus Day/RO		U.S. Gen/LOW	U.S. Gen/RO	U.S. Gen/LOW	U.S. Day/RO
■ Series1	195.79	163.16	130.53	97.89		209.80	174.84	139.87	104.90

Figure 5. US-Russia surviving and retaliating warheads with information and kinetic attacks (1,000-deployment limit)

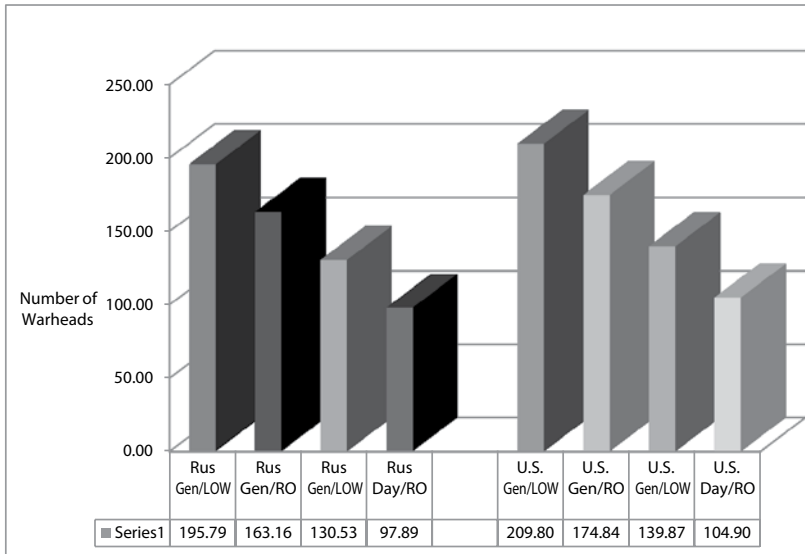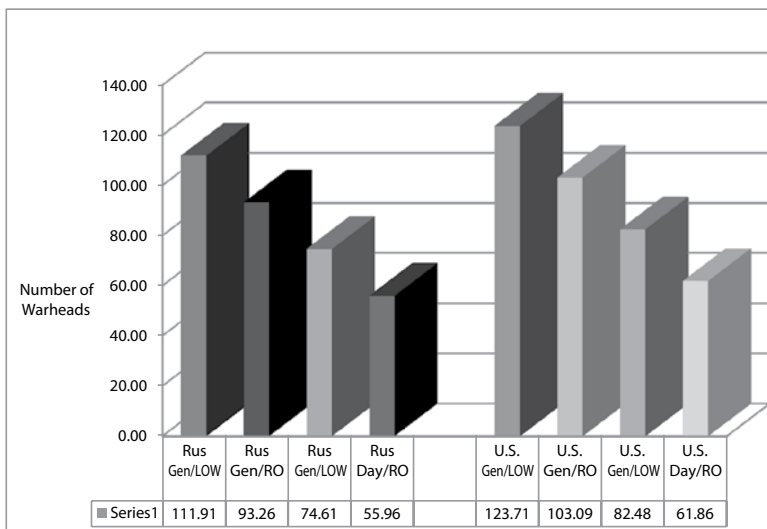|	Rus Gen/LOW	Rus Gen/RO	Rus Gen/LOW	Rus Day/RO		U.S. Gen/LOW	U.S. Gen/RO	U.S. Gen/LOW	U.S. Day/RO
■ Series1	111.91	93.26	74.61	55.96		123.71	103.09	82.48	61.86

Figure 6. US-Russia surviving and retaliating warheads with information and kinetic attacks (500-deployment limit)

Figures 5 and 6 show that, in a hypothetical but not necessarily unrealistic exercise of cyber-kinetic nuclear strike plans, the United States and Russia could still retain sufficient numbers of weapons to create historically unprecedented and socially unacceptable damage in retaliation. Cyber attacks on command-control, communications, and warning systems might lead to ragged retaliations and strikes more dependent upon the most survivable launch platforms such as submarines and mobile missiles. Alternatively, two expectations about such a scenario would be mistaken. First, information operations cannot make any nuclear war between states with large arsenals into a surgical operation or an exercise in "soft" power. Second, a state's cyber and kinetic strategies need to be carefully coordinated as to their political and military objectives, not only up to the brink of war but even beyond that threshold. Otherwise, the objectives of escalation control and conflict termination will be impossible to realize for either state when its opposite number is brain dead as well as partly but not completely disarmed.

Conclusion

Faced with exigent threats, states with cyber capabilities will be tempted to employ them to good effect. For example, imagine a replay of the Cuban missile crisis between a future Russia and the United States, with Russia having deployed nuclear-capable missiles and/or warheads into South Ossetia. Or, to flip the example, hypothesize a NATO missile defense installation deployed to protect Tbilisi or Kiev, supported by short- and medium-range ballistic missiles as a trip wire. One can expect that cyber operations of the information-technical type (attacking enemy systems and networks) as well as the information-psychological variety (influencing public opinion among foreign and domestic audiences, including elites and general publics) will commend themselves to peacetime and crisis political leaders and their military advisors.[27]

The larger context for cyber operations and nuclear deterrence also involves the possible adoption of minimum deterrence force postures and the deployment of missile defenses by the United States and NATO or perhaps others. Minimum deterrence might appeal to the United States and to Russia under very favorable political conditions, including a rethink of European and central Eurasian territory as a unified security community instead of as a fight club. In this regard, the United States and NATO phased adaptive approach to missile defenses offers the choice

between cooperative security and Cold War retro approaches to arms control. Regardless the outcome of the imbroglio over EPAA, US plans for a global missile defense system will include technology transfers and security cooperation with regional allies in Europe, the Middle East, and Asia. Prospective US opponents in those regions may therefore cultivate both nuclear deterrence and information operations as means for antiaccess and area denial (A2/AD) deterrence and defense.

Nuclear deterrence in the Cold War was something sui generis that grew from a way station for coping with new weapons and new threats into an all-purpose solvent for problems of military strategy. Nuclear weapons remain alive and menacing in the twenty-first century, but they are presently and prospectively circumscribed by new contexts. One of these contexts is the coexistence of information warfare or military cyber operations and nuclear deterrence. **SSQ**

Notes

1. For an overview, see P. W. Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century* (New York: Penguin Books, 2009).

2. Stuart H. Starr, "Developing a Theory of Cyberpower," in *Cyber Infrastructure Protection*, eds. Tarek Saadawi and Louis Jordan (Carlisle, PA: Strategic Studies Institute, 2011), 15–28, provides a useful framework for categorizing the elements of the cyber domain, including cyberspace, cyber power, cyber strategy, and relevant institutional factors. US government and other definitions for cyberspace and related concepts are reviewed in Daniel T. Kuehl, "From Cyberspace to Cyberpower: Defining the Problem," in *Cyberpower and National Security*, eds. Franklin D. Kramer, Stuart H. Starr, and Larry K. Wentz (Washington: National Defense University [NDU] Press/Potomac Books, 2009), 24–42. See also, in the same volume, Martin C. Libicki, "Military Cyberpower," 275–84; and Richard L. Kugler, "Deterrence of Cyber Attacks," 309–40. Martin C. Libicki, *Cyberdeterrence and Cyberwar* (Santa Monica, CA: RAND, 2009), argues that strategic cyber war is unlikely to be decisive, although operational cyber war has an important niche role. See also Will Goodman, "Cyber Deterrence: Tougher in Theory than in Practice?" *Strategic Studies Quarterly* 4, no. 3 (Fall 2010): 102–35. Goodman argues that cyberspace poses unique challenges for deterrence but not necessarily impossible ones.

3. Siobhan Gorman and Julian E. Barnes, "Cyber Combat: Act of War," *Wall Street Journal*, 31 May 2011, http://online.wsj.com/article/SB10001424052702304563104576355623135782718.html.

4. On terminology and concepts related to information operations and information warfare, see Timothy L. Thomas, *Cyber Silhouettes: Shadows over Information Operations* (Fort Leavenworth, KS: Foreign Military Studies Office, 2005), esp. chaps. 4–6. Concepts related to information warfare are also discussed in David S. Alberts et al., *Understanding Information Age Warfare*, 3rd ed. (Washington: DoD, October 2004), esp. 53–94; and Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*, 6th prtg. (Washington: DoD, April 2005), esp. 87–122. Col Thomas X. Hammes, USMC, retired, dis-

cusses the Pentagon's Joint Publication 3-13, *Information Operations*, and the DoD's understanding of information in modern warfare in Hammes, "Information Warfare," in *Ideas as Weapons: Influence and Perception in Modern Warfare*, eds. G. J. David Jr. and T. R. McKeldin III (Washington: Potomac Books, 2009), 27–34. See also John Arquilla, *Worst Enemy: The Reluctant Transformation of the American Military* (Chicago: Ivan R. Dee, 2008), esp. chaps. 6–7; and Singer, *Wired for War*, chaps. 10–11 and passim. For perspective on the role of information operations in Russian military policy, see Thomas, *Recasting the Red Star: Russia Forges Tradition and Technology through Toughness* (Fort Leavenworth, KS: Foreign Military Studies Office, 2011), esp. chap. 6 and appendix 1; and Thomas, "Russia's Asymmetrical Approach to Information Warfare," in *The Russian Military Into the Twenty-First Century*, ed. Stephen J. Cimbala (London: Frank Cass, 2001), 97–121.

5. *Cyber war*, according to John Arquilla and David Ronfeldt, is a comprehensive, information-based approach to battle, normally discussed in terms of high-intensity or mid-intensity conflicts. *Net war* is defined by the same authors as a comprehensive, information-based approach to societal conflict. See Arquilla and Ronfeldt, "A New Epoch—and Spectrum—of Conflict," in *In Athena's Camp: Preparing for Conflict in the Information Age*, ed. Arquilla and Ronfeldt (Santa Monica, CA: RAND, 1997), 1–22. Richard A. Clarke, former counterterrorism coordinator for the George W. Bush and Clinton administrations, and Robert K. Knake include both cyber war and net war activities, as defined by Arquilla and Ronfeldt, in their concept of cyber war. See Clarke and Knake, *Cyber War* (New York: HarperCollins, 2010). On definitions and concepts of information warfare, see Martin Libicki, *What Is Information Warfare?* ACIS Paper 3 (Washington: NDU Press, August 1995); Libicki, *Defending Cyberspace and other Metaphors* (Washington: NDU Directorate of Advanced Concepts, Technologies, and Information Strategies, February 1997); Arquilla and Ronfeldt, *Cyberwar Is Coming!* (Santa Monica: RAND, 1992); and David S. Alberts, *The Unintended Consequences of Information Age Technologies: Avoiding the Pitfalls, Seizing the Initiative* (Washington: NDU Institute for National Strategic Studies, Center for Advanced Concepts and Technology, April 1996).

6. Original and insightful discussion appears in Jeffrey R. Cooper, *New Approaches to Cyber-Deterrence: Initial Thoughts on a New Framework* (Washington: Science Applications International Corporation, 29 December 2009), prepared under contract to undersecretary of defense for intelligence, joint and coalition warfighter support, cyber, information operations and strategic studies.

7. Michael C. Libicki, "Wringing Deterrence from Cyber War Capabilities," in *Economics and Security: Resourcing National Priorities—Proceedings, Workshop Sponsored by the William B. Ruger Chair of National Security Economics*, ed. Richmond M. Lloyd (Newport, RI: Naval War College, 2010), 259–72.

8. Libicki, *Cyberdeterrence and Cyberwar*, xvi. See also Cooper, *New Approaches to Cyber-Deterrence*, 2–4 and passim.

9. Benjamin S. Lambeth, "Airpower, Spacepower, and Cyberpower," *Joint Force Quarterly* 60 (1st quarter, 2011): 46–53.

10. Ibid., 51.

11. Colin S. Gray, "Another Bloody Century?" *Infinity Journal* 1, no. 4 (Fall 2011): 4–7.

12. Robert A. Miller, Daniel T. Kuehl, and Irving Lachow, "Cyber War: Issues in Attack and Defense," *Joint Force Quarterly* 61 (2nd quarter, 2011): 18–23.

13. Ibid., 19.

14. Ibid.

15. An alternative minimum deterrent proposal based on infrastructure targeting and intended as a way station to nuclear zero is outlined in Hans M. Kristensen, Robert S. Norris, and Ivan Oelrich, *From Counterforce to Minimal Deterrence: A New Nuclear Policy on the Path Toward Elimi-*

nating Nuclear Weapons (Washington: Federation of American Scientists and Natural Resources Defense Council, April 2009), esp. 31–33.

16. One example of such a system might be the Falcon Hypersonic Technology Vehicle 2 (HTV-2) currently undergoing testing. See Noah Shachtman, "Pentagon's Mach 20 Missile Ready for Ultimate Test," *Wired*, 10 August 2011, www.wired.com/dangerroom/2011/08/pentagons -mach-20-missile?

17. I gratefully acknowledge Michael Noonan, Foreign Policy Research Institute, for this insight. He is not responsible for its application here.

18. Holger Stark, "Stuxnet Virus Opens New Era of Cyber War," *Spiegel Online*, 8 August 2011, http://www.spiegel.de/international/world/0,1518,druck-778912,00.html. See also Michael Riley and Ashlee Vance, "The Code War," *Bloomberg Businessweek*, 25–31 July 2011, http://www .businessweek.com/magazine/cyber-weapons-the-new-arms-race-07212011.html.

19. Force structures are heuristic, not predictive, of actual deployments. For expert assess-ments, see Joseph Cirincione, "Strategic Turn: New U.S. and Russian Views on Nuclear Weapons," *New America Foundation*, 29 June 2011, http://newamerica.net/publications/policy/strategic _turn; Arms Control Association, "US Strategic Nuclear Forces Under New START," http://www .armscontrol.org/factsheets/USStratNukeForceNewSTART; Arms Control Association, "Russian Strategic Nuclear Forces Under New START, http://www.armscontrol.org/factsheets/RussiaStrat NukeForceNewSTART; Pavel Podvig, "New START Treaty in Numbers," from his blog, *Russian Strategic Nuclear Forces*, 9 April 2010, http://russianforces.org/blog/2010/03/new_start_treaty _in_numbers.shtml; Podvig, "Russia's New Arms Development," *Bulletin of the Atomic Scientists*, 16 January 2009, http://thebulletin.org/web-edition/columnists/pavel-podvig/russias-new-arms -development; and *Nuclear Posture Review Report* (Washington: DoD, April 2010).

20. Grateful acknowledgment is made to Dr. James Tritten for use of a model he originally developed. Dr. Tritten is not responsible for any analysis or arguments here.

21. Bruce Blair et al., "Smaller and Safer: A New Plan for Nuclear Postures," *Foreign Affairs* 89, no. 5 (September/October 2010): 9–16.

22. Post–New START Russian nuclear arms control and nonproliferation policy and its im-plications for the United States are reviewed in Stephen J. Blank, "Arms Control and Proliferation Challenges to the Reset Policy," draft paper for delivery at the Carnegie Council–Strategic Studies Institute–Booz Allen Hamilton Conference, *US Global Engagement: Report of Two Years on Activities*, 1–3 June 2011 in Pocantico, NY, cited with permission. See also Daniel Goure, "Russian Strategic Nuclear Forces and Arms Control: Déjà Vu All over Again," in *The Russian Military Today and Tomorrow: Essays in Memory of Mary Fitzgerald*, eds. Stephen J. Blank and Richard Weitz (Carlisle, PA: Strategic Studies Institute, July 2010), 301–29.

23. On this point, see "Russia Warns of Response to U.S. Missile Shield," *VOA News*, 23 November 2011, http://www.voanews.com/english/news/europe/Medvedev-Accuses-USNATO -Ignoring-html. See also "Missile Shield Remarks Forced Measure, Not Political Rhetoric— Medvedev," *RIA-Novosti*, 1 December 2011; "US Could Threaten Russian Strategic Nuclear Forces—Foreign Minister Lavrov," *RIA Novosti*, 1 September 2011, http://en.rian.ru/military _news/20110901/166347758.html; "Russia's Case to NATO for Integrated Missile Defense," *Stratfor .com*, 11 August 2010; "New Submarine Supermissile Can Pierce ABM Shield," *Russia Today*, 10 August 2011, www.russiatoday.com; and "Newspaper: Russia Is Developing New Generation ICBM," *Monsters and Critics*, 19 July 2011, http://www.monstersandcritics.com/news/europe /news/article_1651916.php.

24. A skeptical view of reset-bashing is offered in Samuel Charap, "Reset This: What's Behind the Ginned-Up Crisis in US-Russia Relations?" *ForeignPolicy.com*, 12 August 2011, http://www .foreignpolicy.com/articles/2011/08/12/reset_this.

25. However, it deserves emphasis that even "small" nuclear attacks against infrastructure would leave historically unprecedented damage with large recovery times. For illustrations, see Office of Technology Assessment, *The Effects of Nuclear* War (Washington: Government Printing Office, 1979), 63–80.

26. Interestingly the attacks might not have been conducted directly by the Russian government but by sympathetic shadowy groups such as the Russian Business Network, notable for cyber crimes including the kind of DDOS (distributed denial of service) attack visited upon Georgian websites. See Ariel Cohen and Robert E. Hamilton, *The Russian Military and the Georgian War: Lessons and Implications* (Carlisle, PA: Strategic Studies Institute, June 2011), esp. 44–49; and Timothy Thomas, *Recasting The Red Star: Russia Forges Tradition and Technology through Toughness* (Fort Leavenworth, KS: Foreign Military Studies Office, 2011), esp. 247–51.

27. For this distinction, following Russian nomenclature, see Thomas, *Cyber Silhouettes*, 74.

Fiscal Fetters

The Economic Imperatives of National Security in a Time of Austerity

Mark Duckenfield

On 16 May 2011, the US Treasury ceased borrowing money to conduct its operations when Congress and President Obama reached an impasse over raising the debt ceiling. Faced with this slowly unfolding political and economic crisis, many American and foreign observers felt compelled to ask themselves whether it was the harbinger of an impending fiscal and financial apocalypse. If the financial integrity of the United States required serious reductions in spending, would the steps necessary to ameliorate the country's budgetary woes have consequences for its foreign and security policies? Resolving these fiscal pressures confronts US security policy makers with two unpalatable prospects—a reduction in resources available for the overseas military component of American policy well below the high levels available after the September 11 attacks, or a reduced willingness and inability to pursue an activist security policy stemming from the increasing costs of funding ever-higher government debt burdens. It also presents the spectre of the United States facing a future "Suez moment," where its military commitments are abruptly curtailed, perhaps under foreign or financial pressure, just as Britain and France's military seizure of the Suez Canal from Egypt foundered in 1956 when confronted with the fiscal realities of their relative economic decline.[1] The most viable option for sustaining current American interests in a time of diminished means and avoiding a future geopolitical triage is a resurrection and expansion of the Nixon Doctrine—which transferred the primary burden of their

own defense onto the United States' East Asian allies during the Vietnam War—not only in the Pacific but in the Middle East and Europe as well.

In 1969, early in his first term of office, Pres. Richard Nixon responded to the ongoing conflict in Vietnam and growing budgetary pressures by laying out a framework designed to draw down the number of American troops in Vietnam, recalibrate US security commitments throughout East Asia, and ultimately reduce the cost to the United States in troops and money of providing security in Southeast Asia. Nixon pledged to retain treaty obligations as well as continue to provide a nuclear umbrella over regional allies, but he eschewed the large-scale use of American ground forces. Henceforth, Nixon told the nation in November 1969 that the United States would rely upon local allies to provide the predominant number of ground troops in any armed conflicts in their countries. This had the goal of conserving American manpower, sharing responsibility more broadly with allies, and ultimately shoring up domestic support for overseas operations. The "Vietnamization" plan, already underway when Nixon made his speech, was accelerated, and the American troop presence in South Vietnam dropped from 540,000 in January 1969 to 175,000 by 1971 and 95,000 in the first half of 1972.[2] The withdrawal of US ground forces was completed in 1973.

The disheartening and demoralizing defeat of South Vietnam in 1975 did little to alter the extent of US reliance on air and naval power rather than land power in the region. Indeed, defeat in Vietnam fueled the move-ment away from an Army based on draftees and accelerated the transition to a much more professionalized force. The subsequent military reorienta-tion surrounding the withdrawal from Vietnam led to a reformation of US security policy that culminated in creation of the all-volunteer force.[3] This strategic transformation of its military played to US strengths in capital-intensive warfare and technological innovation while pivoting away from the manpower-intensive strategies epitomized by the politically un-popular draft.

In 2012, the United States faces similar strategic challenges. The major counterinsurgency in Iraq has drawn to a close, and the Obama admin-istration is looking for a strategy for withdrawing the bulk of US combat forces from Afghanistan in the near future. The human and monetary costs of prolonged counterinsurgency operations have made such inter-ventions politically unpopular and fiscally unattractive. Still, the United States remains committed to a large number of allies and has interests in

the political and military stability of many regions of the world. Advancing these interests and sustaining these commitments need to be squared with a sustainable fiscal framework.

This article draws together two crucial policy areas—national security strategy and economic policy. Successful interaction of these two policy spheres would simultaneously protect America's prosperity and promote its political and economic interests around the world. But herein lies the real dilemma—How can the United States afford these policies in an age of austerity? How can such a strategy be funded in the wake of the global economic crisis? How can policymakers justify this at a time when there is less money available to fulfill domestic social obligations?

To address these questions, we examine the US fiscal condition with a focus on the consequences for security budgets that will stem from future spending restraint or financing debt. Next, we argue the relationship between economics and national security and how it is embodied in the current global economic system and discuss primary challenges the United States faces, along with its formidable advantages. Finally, this article brings these themes together to argue that to avoid a moment of "geopolitical triage," the United States will need to better align its military commitments to more closely match available resources, especially in manpower-intensive operations. As part of this strategy, the United States should expand its efforts to support multilateral security and economic institutions and better integrate our allies and other countries into the effective management of regional security issues and the governance of the international economy.

Economic prosperity is at the heart of US national security. The Obama administration's May 2010 *National Security Strategy* calls attention to the degree to which our international influence and our ability to obtain political outcomes depend upon our economic success. The *National Security Strategy* highlights the central role of economic strength to the retention of our geopolitical position in the wake of the economic crisis, arguing in its introduction that "at the center of our efforts is a commitment to renew our economy, which serves as the wellspring of American power."[4] It elaborates later in the document that "our prosperity serves as a wellspring for our power. It pays for our military, underwrites our diplomacy and development efforts, and serves as a leading source of our influence in the world."[5] A growing, thriving economy provides our government with more revenue, greater flexibility in how to expend resources, and fewer constraints on its spending priorities, military or otherwise. In contrast, a

stagnant economy finds our government with fewer resources at its command, greater constraints on how it spends money, and difficult choices between foreign and domestic priorities.

There is a tension, of course, between creating a virtuous circle of prosperity, security, and more prosperity. Policymakers need to tread the narrow path between the Scylla of security overstretch, whereby they expend too many resources on security to the detriment of domestic economic and social priorities, and the Charybdis of underprotection, whereby the international community underinvests in securing the global commons, and international collective goods are underprovided to the detriment of international stability.[6] Providing the institutions for a stable international economic environment and the military forces for a stable security situation is not cost free, and it is also difficult to exclude those who do not contribute from the benefits of such a system.[7] Countries have an incentive to "free ride" on the contributions of others, reaping the benefits of order and stability without bearing the burden of supporting the system.[8]

At the same time, the *National Security Strategy* does little to reconcile the competing and often conflicting demands of international political influence, security, prosperity, and values promotion. No matter how much US policy makers might desire international victories on the cheap, the extent of international commitments and aspirations are—under present conceptions of American national interests—extensive, expansive, and expensive. At the same time, the government's long-term domestic commitments are no less costly. Setting aside the temporary, short-term increase in budget deficits to deal with the ongoing economic slowdown, the United States faces serious fiscal challenges over the medium and long term, as rising costs of health care—especially for the elderly—will demand greater and greater resources from the federal government.

Fiscal Fetters

In December 2010, Alan Simpson and Erskine Bowles, the co-chairmen of the National Commission on Fiscal Responsibility advocated freezing discretionary spending, including base defense expenditures, at FY 2011 levels through FY 2020.[9] The Budget Control Act of 2011 is equally draconian. It put in place caps on discretionary spending (both security and nonsecurity) and created the Congressional Joint Select Committee on Deficit Reduction, the so-called Super Committee, to negotiate a 10-year

plan for $1.5 trillion in fiscal consolidation by January 2012. The failure of the Super Committee to come to agreement promises to trigger mandatory reductions of $1.2 trillion—including interest savings—in discretionary spending between 2013 and 2021. Half of these cuts would come from security expenditures and half from other discretionary spending, although overseas contingency operations are not subject to the caps.[10] The defense portion of these potential automatic cuts is potentially as high as $55 billion per year ($492 billion over 10 years), or between 8.5 and 10 percent of planned defense spending over the period.[11]

Limits on what had previously been relatively unfettered defense spending are already beginning to materialize. The Defense Department's 2013 budget proposal puts a realignment of force structure and procurement at the heart of the ongoing fiscal retrenchment. Under current proposals much of the personnel reductions will come from the manpower-intensive services—the Army will see a 15-percent reduction in the active force from 562,000 to 490,000 over the next five years, and the Marines will reduce their numbers by 10 percent to 182,000 from 202,000 today.[12] The Navy will drop only 6,200 Sailors to 319,500, a 2-percent reduction, and the Air Force will be reduced by 1.3 percent, or 4,200 Airmen, for an active strength of 328,600 in 2017.[13] Over the next five years, the department proposes that the Navy decommission seven existing cruisers and two landing ships and the Air Force be reduced by 303 older aircraft, primarily reserve units.[14] Base budgets will also be affected by reductions in procurement, primarily falling on the Air Force, which bears $2.6 billion of a total $5.0-billion procurement reduction. This is primarily related to terminating or restructuring several expensive aircraft and aerospace projects.[15]

The Simpson-Bowles proposal for a near freeze in overall security spending—endorsed in general terms by several presidential candidates—provides $981 billion less than the president's FY 2013 budget between 2012 and 2020, or just over a further $100-billion reduction per year.[16] Such a proposal could imply an active duty Army of less than 450,000 Soldiers, a Marine Corps of 150,000, a fleet with only 10 aircraft carriers, a 50-percent reduction in the number of F-35s purchased, and a reduction of nearly 20 percent in the DoD civilian workforce.[17] Fulfilling this reduced budget target of $700 billion in security expenditures in 2020—as opposed to President Obama's target of $820 billion in the same year—could include cancellation of a range of weapons systems: the V-22

Osprey, the expeditionary fighting vehicle, the Marine Corps version of the F-35, the future maritime prepositioning force, the joint tactical vehicle, the ground combat vehicle, and the joint tactical radio.[18]

The consequences of erosion in America's economic and fiscal prospects over an extended time frame have equally grave implications for its national security. This theme has been elaborated on at the highest levels of the armed services. ADM Michael Mullen, the former chairman of the joint chiefs, argued in multiple public appearances that "the most significant threat to our national security is our debt. . . . [T]he strength and the support and the resources that our military uses are directly related to the health of our economy over time."[19] Even after the August 2011 debt deal, Mullen still had great concerns about the debt.[20] His successor, GEN Martin Dempsey, while not placing the debt as the primary security threat, agrees with his predecessor that "the national debt is a grave concern."[21]

To pull the economy out of the financial crisis and stimulate a recovery, the United States has undertaken an expensive short-term bailout of the financial sector and launched a moderate stimulus package of federal spending accompanied by tax cuts and credits. The inevitable consequences of a recession and a high level of joblessness have also confronted the federal government with lower revenues at the same time it is called upon to provide greater expenditures for unemployment. The short-term fiscal imbalance has widened dramatically, albeit temporarily, before declining to an annual deficit estimated at 8.7 percent of GDP for FY 2011.[22] Short-term countercyclical spending is by no means incompatible with long-term fiscal consolidation, and the president's proposed 2013 budget takes the deficit back to a longer-term average of just under 3 percent of GDP by the middle of the coming decade,[23] but even this level of fiscal imbalance still promises serious economic consequences. Over the long term, rising debt loads will crowd out other federal spending and could undermine the international position of the dollar as the world's reserve currency.[24] This in turn could result in higher interest rates, reduced economic growth, and lower standards of living for Americans.

Figure 1, from the Congressional Budget Office, illustrates a variety of possible fiscal paths to the future. The "worst-case" scenario of expanded deficits, higher debt loads, and deteriorating public finances occurs under the CBO's alternative fiscal scenario, whereby popular tax provisions are extended and current legislation aimed at cost-containment of entitlement programs are repealed. On the one hand, that scenario is probably

overly alarmist; however, even the so-called baseline scenarios with these provisions retained shows a slight weakening of the government's budgetary position over the next several decades as the population ages and health care costs rise.[25] Only the severe cuts and sequestrations promised in the Budget Control Act (BCA) of 2011 make any meaningful dent in the debt load in the medium term. This will have direct consequences on the amount of money the federal government will have available to spend on defense in the coming years.
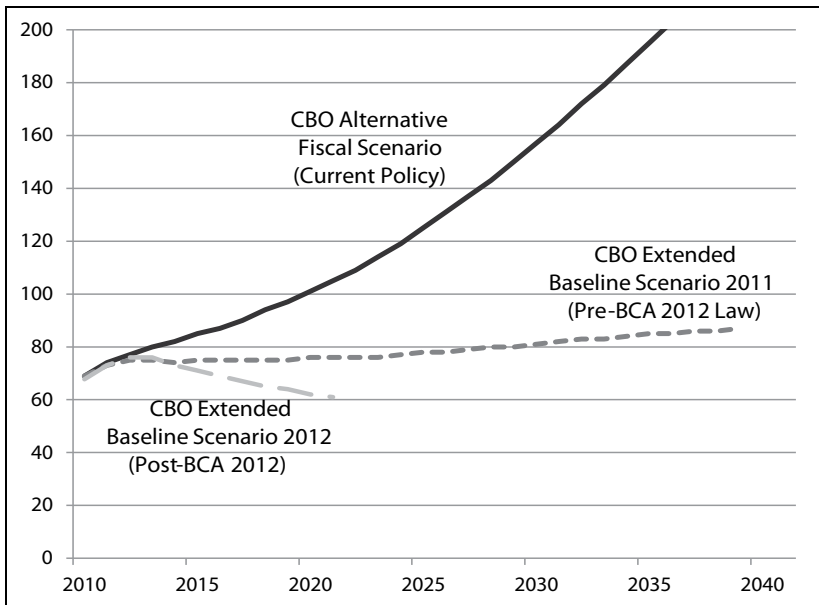
Figure 1. Debt as a percent of GDP, 2010–2040

The Extended-Baseline Scenario generally assumes continuation of current law. Longer-term CBO projections for the pre–Budget Control Act 2011 are presented as are the CBO's medium-term projections through 2022 including sequestrations under the Budget Control Act of 2011. The Alternative Fiscal Scenario incorporates several changes to current law considered likely to happen, including renewal of the 2001/2003 tax cuts on income below $250,000 per year, continued Alternative Minimum Tax (AMT) patches, continuation of the estate tax at 2009 levels, and continued Medicare "Doc Fixes." It also assumes discretionary spending grows with gross domestic product (GDP) rather than inflation over the next decade, that revenue does not increase as a percent of GDP after 2020, and that certain cost-reducing measures in the health reform legislation are unsuccessful in slowing cost growth after 2020.[26]

Under budget caps negotiated as part of the Budget Control Act of 2011, total federal spending will drop by 1.1 percent of GDP—from

25.1 percent (FY 2010) to a projected 24.0 percent—over the course of the coming decade. Despite this proposed shrinking of government, some areas will see growth between now and 2021: Medicare (+0.5 percent), Medicaid (+0.5 percent), Social Security (+0.5 percent), and interest on the national debt (+1.4 percent). The decreases to compensate for the 4.0 percent of GDP represented by these growing expenditures and the reduction in the size of government are predominantly in discretionary expenditures. Nondefense discretionary programs (-2.1 percent) and defense (-1.1 percent) take the brunt of the reductions compared to other mandatory programs (-0.8 percent). It is important to note that much of the latter reduction will result from reduced demand on income support programs, such as unemployment payments, food stamps, and housing assistance, due to improved economic conditions.[27]

Even at the same level of overall expenditure, interest payments begin to crowd out spending on other government programs, reducing the range of resources available to policymakers in the future. Deficient tax revenues, health care spending, interest on the debt, and defense spending are the four horsemen of the fiscal apocalypse.

Within this environment, discretionary spending is particularly vulnerable to cutbacks. Overall, discretionary spending is projected to drop from 37 percent of government spending to 26 percent at the start of the next decade.[28] The brunt of the declining budget share falls on the nonsecurity side of the discretionary budget, which will see its share slashed from 18 percent to 12 percent over the next 10 years.[29] The security share of the budget gets off relatively lightly compared to the rest of the discretionary budget. Defense is projected to decline from 19 percent of the budget in 2011 to 14 percent by 2021, which comes out to about 3.0 percent of GDP.[30] The Obama administration expects to have wound down operations in Iraq, Afghanistan, and Libya by then, but these figures still allow for $44 billion in contingency operations annually through 2022, so there is further room to give.[31] Nevertheless, the discretionary side of the budget, which includes security expenditures, is under serious pressure.

In 2004, Niall Ferguson argued, "Americans like security. But they like Social Security more than national security."[32] Opinion polls have repeatedly supported the contention that the American public—regardless of party preference—prioritizes spending money on social programs over national security expenditures (table 1).

Table 1. Social and national security priorities, 2011

Question: "If you had to choose one, which would you chose to cut in order to cut government spending?"

	All	Democrats	Independents	Republicans
Military	55 %	66 %	55 %	42 %
Medicare	21 %	10 %	24 %	31 %
Social Security	13 %	11 %	15 %	17 %
No Opinion	10 %	13 %	7 %	10 %

(*New York Times*/CBS News Poll, 20 January 2011)

Unlike the national security budget, Social Security is funded by its own system of taxation and the Social Security Trust Fund. According to the latest report from the Social Security trustees, the combination of these two funding streams is sufficient to fully fund the federal government's retirement obligations through 2036.[33] However, the subsidy that Social Security surpluses have provided to the federal budget for the past 30 years is ending, and that puts additional financial pressure on discretionary spending. Medicare—funded by payroll taxes, premiums, and a trust fund—will start to become a drag on the general government budget sooner, as its trust fund will be exhausted in 2024, and it will increasingly need to draw on general receipts to fund its operations after that date.[34]

The slow-motion health cost crisis affects national security both from above and below. By claiming an ever greater share of gross national product and government expenditure, it crowds out all other budget items. Security is not the most affected, but substantial reductions could threaten core defense expenditures and jeopardize the successful implementation of various defense programs over the medium and long terms. At the same time, the Department of Defense (DoD) is generating its own internal health care crisis. Within the defense budget, the cost pressures of medical care are forcing limitations on other parts of the department. In May 2010, Secretary of Defense Robert Gates told an audience at the Eisenhower Library that "health care costs are eating the Defense Department alive."[35] In 2005 the Defense Budget Board noted that the military health care system was costing $34.2 billion, a figure that it ominously predicted would reach $50 billion per year in 2015.[36] The department was able to achieve that dubious target four years ahead of schedule in 2011, when nearly 10 percent of the base DoD budget went for health care.[37]
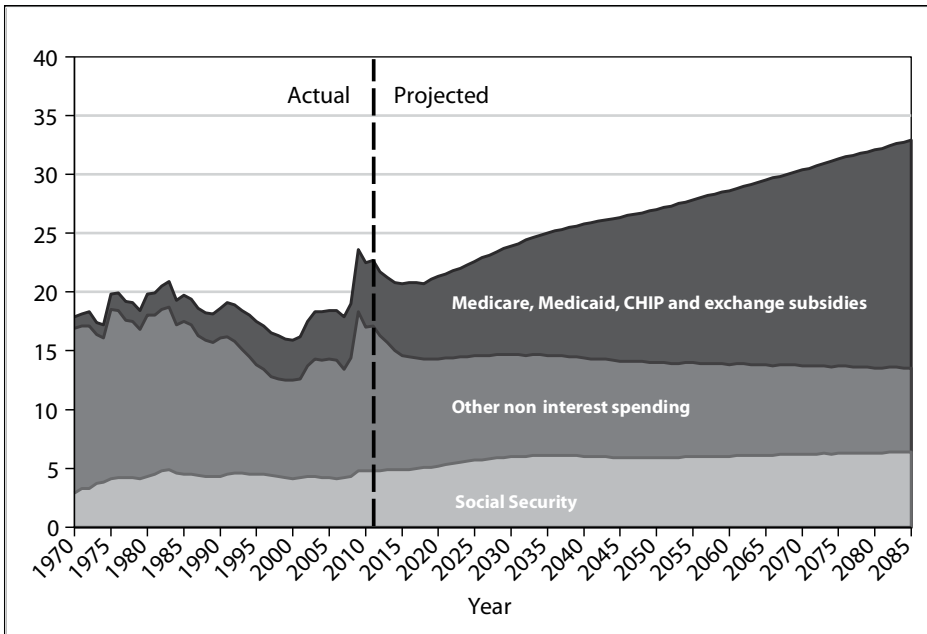
Figure 2. Primary spending by category
(Alternative Fiscal Scenario from CBO dataset [2011], http://www.cbo.gov/doc.cfm
?index12212)

The rising cost of medical care within the operations budget is limiting the government's ability to provide funds for other military activities. Similarly, military pensions are also a substantial drain on defense resources. While private sector employers make pension contributions at 4–12 percent of their employees' salaries, the cost of adequately funding military pensions is the equivalent of 75 percent of salary, for a total of $46 billion in 2011.[38] Taken together, medical care and retirement contributions were $96 billion in FY 2011, more than 17 percent of the entire defense budget. The Military Retirement Trust Fund will disburse over $49 billion in FY 2012, a figure that is likely to grow to over $75 billion in the course of the decade.[39]

Military entitlements also extend to veterans who served in Iraq and Afghanistan. As of December 2006, almost half of the 1.4 million active duty and reserve members of the armed forces who had served in Iraq and Afghanistan were eligible for health care through the Veterans Administration (VA).[40] Both the number of personnel who have served in Afghanistan and Iraq and those who have become eligible for VA services have increased in the six intervening years. Furthermore, the need for health services for veterans increases with age. The peak in

VA spending on veterans of the Second World War peaked in 1992, nearly half a century after the end of that conflict.[41] Seen in this light, VA expenditures on veterans of the Iraq and Afghan operations will be a long-term entitlement time bomb and will likely be at their highest levels after the 2050s.

Recently, an independent assessment of American defense spending in the coming years presented a variety of options for reducing procurement and personnel, but ultimately concluded that "it will be difficult to generate considerable savings without addressing military personnel costs, which include not only salaries but also a range of retirement and health care benefits."[42] The costs of military entitlement programs, like civilian entitlement programs, are politically difficult to rein in, as both the Bush and the Obama administrations have discovered in their unsuccessful efforts to modestly raise premiums for Tricare, which remain at the same *nominal* level they were in 1995![43] The Obama administration has made minor increases to fees for new Tricare enrollees, but it is unclear whether Congress will approve more broad-ranging cost savings.[44] If these trends continue, Soldiers in 2020 might find themselves operating increasingly outdated equipment to free up resources within the defense budget for their health and retirement costs.

The United States is in no risk of becoming the next Greece, the soft underbelly of the Euro Zone, as the negative interest rates on inflation-indexed US Treasury bonds out to seven years attest. However, with economic recovery, these interest rates will increase to more normal levels. The rising debt load over the long term and the cost of servicing that debt, coupled with increasing government health care costs, will force policymakers to choose between three unpalatable options if they want to put the budget on a sustainable trajectory:

1. Raise federal revenues as a share of GDP,

2. Make major changes to entitlement programs for the elderly, or

3. Reduce the role of the federal government relative to the size of the economy. [45]

Of course, these options are not mutually exclusive; however, the changes that Congress and President Obama have already agreed to in the August 2011 budget compromise indicate that discretionary spending,

including defense, will receive a large proportion of any budget cuts over the medium and long term. Whatever the exact outcome of the debate over the share of budgetary consolidation between tax increases and spending cuts across different programs, it is clear that limits on defense spending will be a contributor to any fiscal consolidation. The unusually high level of defense expenditures in the wake of the September 11 attacks allowed for an enlarged defense budget, where few hard choices had to be made between competing priorities. Those days are over. The difficult decisions about budgetary priorities will have consequences for how the United States is able to pursue its national and economic security interests in the years ahead.

Economics and National Security: The American International System

The US national security strategy does not take place in isolation from other policy areas. It is intrinsically linked to operation of both the international political and economic systems. The international economic system of trade and monetary affairs was largely constructed by American policy makers after the Second World War. The American system has pillars embedded in the economy and political system, both domestically and internationally, and is the model the United States has exported to its allies and held up as an example to others. At the domestic level, there is an emphasis on the market as the central form of economic organization, and it is paired with democratic constitutional governance, a welfare state, and independent central banks. At the global level, there are a range of multilateral economic institutions for the governance and management of international commerce, monetary relations, and development: the World Trade Organization (WTO), the International Monetary Fund (IMF), and the World Bank.

The economic superstructure, both in its domestic and international incarnations, is designed to support and facilitate the operation of the free-market economy. In the domestic arena, the welfare state itself is designed to cushion some of the harsher blows of the free market and thus preserve popular support for a broad market-based economy.[46] At the international level, organizations like the IMF and the World Bank help provide assistance to countries in economic difficulty so they do not defect either by

pursuing "beggar thy neighbor" policies or isolating themselves from the international system of free trade and free capital movements.[47]

On top of all this is the international security superstructure, with institutions such as the United Nations and the North Atlantic Treaty Organization. NATO, in particular, has served as the central security umbrella for the United States to provide political security for its allies. NATO provided the defense that European countries needed to continue to develop their own market economies free from Soviet domination during the Cold War. NATO, and bilateral American security relationships in Asia, provided the secure conditions that enabled the West to fully develop a thriving economic base. In this regard, while both the security and economic superstructures themselves protect the economic base and civil society, they also have a reciprocal relationship with them.

The centrality of the United States to the primary institutions of international economic governance, the IMF and the World Bank, has provided American policymakers with substantial sway over foreign economic policies. Both of these institutions are located in Washington; indeed, they are almost within sight of the White House and the US Treasury. Geographic proximity to the headquarters of these institutions makes for a great deal of influence, as do structural factors such as the US veto in each body and the fact that the vast majority of the IMF and World Bank staffs hold economics degrees from American universities. IMF policies have traditionally corresponded quite closely to both American security interests and those of the American financial sector—so much so that some have labeled the interlocking relationships a Wall Street–Treasury–IMF complex.[48] The power of this network of institutions is quite pervasive. If a country needs international financial assistance, it usually must come to Washington for aid. As a result, these institutions, particularly the IMF, have become notorious among recipient nations for the conditionality of their loans that emphasize free-market, neoliberal solutions to financial and fiscal crises.

This political and economic arrangement was the one that prevailed in the Cold War, providing unmatchable economic prosperity for the West under a multinational security system led by the United States. By 1989, not only were Americans more than twice as wealthy as Soviet citizens, but also other key participants in the American system were much better off than comparable nations. West Germany outpaced East Germany in per capita income by at least 50 percent, South Korea's was four times that

of North Korea, Spain had over twice the per capita GDP of Poland, and so on.[49] With the fall of the Berlin Wall and the end of the Cold War, the great ideological confrontation ended with the general acceptance of the superiority of market economies, democratic governance, Western-style welfare states, and free trade. Instead of being a capitalist American system in competition with a state-socialist Soviet system, we have had what Paul Williamson, a former chief economist of the World Bank, has coined "the Washington Consensus."[50]

Being the current leader of the international system and creator of all its major institutions is an immense structural advantage that the United States still enjoys over 20 years after the end of the Cold War. In these two decades, the developed economies of the world, particularly in Asia, have succeeded within the framework of the international economic system. The transfer of manufacturing capacity to the developing world has accelerated since 1990, and as a consequence, the wealth of the world is shifting. Presently, there is a rough balance of global GDP between the wealthy members of the Organization of Economic Cooperation and Development (OECD)—which includes Mexico and Turkey alongside the United States, the European Union, and Japan—and the developing world, including China, India, and Brazil. Ten years ago, the OECD countries had 60 percent of world GDP. By 2030, the developing world will have moved from parity with this broad definition of the developed world and will itself be approaching 60 percent of world economic output.[51]

While many developing economies have benefited from this shift, popular and scholarly attention has tended to focus on the implications of economic change for the large, populous developing economies. Researchers for the investment bank Goldman Sachs coined the term *BRIC* to describe the large-population economies of Brazil, Russia, India, and China, whose growth over time threatens to overtake that of the United States and the rest of the G-7.[52]

Keeping in mind that economic projections into the future can be problematic, Goldman Sachs' projections provide a useful starting point for envisioning the future state of the world's major economies. According to the IMF, the United States, with a GDP of $14.5 trillion, is currently the world's largest economy, with the Chinese economy over one-third as large at $5.9 trillion.[53] The Japanese economy ($5.5 trillion) is roughly on par with the Chinese, and the remainder of the world's largest

economies are close US allies in Europe such as Germany ($3.2 trillion), France ($2.6 trillion), Britain ($2.3 trillion), and Italy ($2.1 trillion).[54] The Indian and Russian economies are approximately the size of Canada's $1.6-trillion economy.[55] By 2030, China will have the largest economy in aggregate, having passed the United States sometime after 2025. The Indian and Brazilian economies will have surpassed the individual national economies of Western Europe, and Russia will be at approximately the same aggregate size.[56] The European Union, Japan, and the United States will remain populous and wealthy in per capita terms, but their positions will no longer be unrivalled. However, the security consequences of this relative economic erosion can easily be overstated. India and Brazil are supporters of the current global order, China has benefitted immensely from the current international system, and Russia will, in the best of circumstances, only reach parity with Germany around 2030, but with a similarly geriatric and declining population.

The Coalition of the Status Quo and its Challengers

At the same time, the world military situation at first glance looks to be overwhelmingly in favor of the United States and its allies (table 2). This group of supporters of the existing international political and economic system could accurately be termed the "Coalition of the Status Quo." The United States alone accounts for over 40 percent of world military expenditure. Our NATO allies have over one-third of the remaining portion—more than five times that of Russia. Our major Asian and Pacific allies have over 14 percent of the non-American military expenditure in the world—more than China. Our allies in the Persian Gulf region spend over 10 times what Iran spends on its military. In all of these regions, these expenditure advantages are matched by a qualitative advantage in advanced equipment and highly trained, professional personnel who regularly conduct exercises with the United States and frequently with each other. Taken together, this worldwide network of alliances and bilateral military relationships is responsible for over 75 percent of the military spending on the planet and covers an arc from Europe through the Middle East and the Indian Ocean and encompasses the dynamic economies of southern and east Asia. This is the hard core of the Coalition of the Status Quo.

Table 2. World military spending, 2010

Country	Military spending ($B)	% world total	% non-US total
United States	698.3	43.3	----
Rest of NATO	317.4	19.7	34.8
East Asian/Oceania allies:	130.0	8.1	14.3
Japan	(54.5)	(3.4)	6.0
South Korea	(27.6)	(1.7)	3.0
Australia	(24.0)	(1.5)	2.7
Taiwan	(9.1)	(0.6)	1.1
Singapore	(8.4)	(0.5)	0.9
Thailand	(4.8)	(0.3)	0.5
Philippines	(1.6)	(0.1)	0.2
China	1 19.4*	7.4	13.1
Gulf allies:	73.2	4.5	8.0
Saudi Arabia	(45.2)	(2.8)	5.0
UAE	(16.1)	(1.0)	1.8
Kuwait	(4.6)	(0.3)	0.5
Oman	(4.2)	(0.3)	0.5
Qatar	(2.4) **	(0.1)	0.2
Bahrain	(0.7)	(< 0.1)	0.1
Russia	58.7	3.6	6.4
India	41.3	2.6	4.6
Israel	14.0	0.9	1.6
Iran	7.0 **	0.4	0.8
Others:	152.1	9.4	16.7
Brazil	33.5	2.1	3.7
Egypt	4.3	0.3	0.5
South Africa	4.5	0.3	0.5
Total	**1,611.4**	**99.9**	**100.3**

* The DoD estimates this figure at $81.2 billion for 2010 and $91.5 billion for 2011 (Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China* [Washington: GPO, 2011], 41).
** 2008
Dollar figures are 2010 current dollars. Percentages do not always sum to 100.0 percent due to rounding.
(*SIPRI Military Expenditure Database 2011*, http://milexdata.sipri.org)

Comparing the extent of US military power and that of its allies versus possible rivals and the implications of this relative balance of military might for the future of American security spending, former secretary of defense Robert Gates argued that

> [the department's] approach to requirements must change. Before making claims of requirements not being met or alleged "gaps"—in ships, tactical fighters, personnel, or anything else—we need to evaluate the criteria upon which require-

ments are based and the wider real-world context. For example, should we really be up in arms over a temporary projected shortfall of about 100 Navy and Marine strike fighters relative to the number of carrier wings, when America's military possesses more than 3,200 tactical combat aircraft of all kinds? Does the number of warships we have and are building really put America at risk when the U.S. battle fleet is larger than the next 13 navies combined, 11 of which belong to allies and partners? Is it a dire threat that by 2020 the United States will have only 20 times more advanced stealth fighters than China?[57]

Many states that are not formally linked into the core of the US security network are status quo powers or can readily be encouraged to support a stable economic and security environment. Brazil, India, and South Africa have all experienced rapid economic growth, even as the economies of the developed world are suffering stagnation in the wake of the economic crisis. Each of these major countries has prospered within the existing economic system and serves as a source of stability within its own region. They are, if anything, at least passive supporters of the Coalition of the Status Quo, providing regional anchors of economic stability.

Of course, money spent on security is an imprecise measure of security threat. North Korea's relatively minor $10-billion budget outlay,[58] backed by an army of conscripts and a handful of nuclear devices, still threatens to wreak havoc on the prosperous areas of East Asia. The September 11 attacks were carried out on a budget of less than $500,000.[59] Regrettably, creating insecurity is a lot less expensive than providing security. However, it is not clear that massive additional American security expenditures will provide any additional deterrence to North Korean or Iranian actions. Indeed, the reverse might be true—current intelligence assessments provided to Congress indicate that both Iranian and North Korean nuclear programs are motivated by their military *weakness* compared to the United States and its regional allies as well as their own isolation and lack of international prestige.[60] In other words, they seek to *deter us* with their nuclear programs. This is not to say we should be sanguine about these programs, but it does entail recognition that additional military expenditures will not resolve some of the most important strategic threats facing the United States and its allies.

Despite fears to the contrary, the waning of American power relative to China does not mean that China is positioned to emerge as a new hegemon, even in East Asia. Some observers are concerned that China has already reached a point of hegemony or near hegemony in the world economy.[61] There are corresponding concerns about China's military power.[62] How-

ever, this seriously overestimates Beijing's strengths and fails to appreciate existing and enduring American (and allied) advantages economically, geographically, and militarily.[63] The choke points of world commerce are the Strait of Gibraltar, the Bosporus, the Suez Canal, the Strait of Malacca, the Strait of Hormuz, the Bab el-Mandeb, the North Sea, and the Panama Canal, all of which are dominated by the United States and its allies. Of these, the Straits of Hormuz and Malacca are critical for the supply of oil and raw materials to East Asia.[64] The extent of its military bases, alliances, and global military reach give the United States a stranglehold on these choke points. While the United States might have to accept that its traditional hegemony over global commons might not be as expansive as it once was, the extent of American military domination of air, sea, and space is still extraordinary.[65] Even in the few areas where it might be denied access, American military power will retain the ability to itself deny any potential adversary access to international naval and air space. Rather than a direct military confrontation with China, for instance, a policy of a distant blockade would be extremely effective in using a combination of American and allied military power to exploit China's relative geographic and economic vulnerability to deter or, if necessary, coerce China should the United States and China blunder into a political dispute in East Asian waters.[66]

Avoiding Geopolitical Triage

In 1956, Britain and France were still recovering from the economic aftereffects of the Second World War and attempting to hold onto the remnants of their colonial empires when Pres. Gamal Abdel Nasser of Egypt, the leading Arab nationalist of the era, nationalized the Suez Canal from its British and French stockholders and began obstructing Israeli shipping. In covert agreement with Britain and France, Israel attacked Egypt. Britain and France used the pretext of Israeli-Egyptian hostilities, which they themselves had conspired to precipitate, to deliver an ultimatum to Egypt and Israel to cease hostilities and followed that up with an invasion of the Suez Canal zone. British and French intervention shocked the Eisenhower administration, which had not been consulted, and the United States brought extensive political and economic pressure to bear on Britain and France, curtailing oil exports and obstructing their access to loans from the United States and multilateral institutions.[67] The financially

strapped and militarily overextended west Europeans were forced into a humiliating retreat that clearly demonstrated the reality of their post–World War II decline from great-power status.[68] As British prime minister Anthony Eden noted, the debacle at Suez "has not so much changed our fortunes as revealed realities."[69]

What routes are there to avoid a geopolitical day of reckoning, a twenty-first-century "Suez moment" for the United States, where its security commitments are dramatically revealed to outstrip its resources and capacity to support them? The United States could, of course, cut the Gordian knot of revenue constraint and find ways of generating the tax revenues to match its domestic and international commitments. With revenue projections around 20 percent of GDP and expenditures at 24 percent, the interest required to fund an annual deficit of that magnitude explains much of the imbalance. Indeed, the primary budget—the base budget minus interest payments—is in balance over the medium term. A second, and not mutually exclusive, option is to further curtail spending. As we have seen, there are likely to be fewer resources available for an interventionist foreign policy and much greater congressional and public sensitivity to the cost of such operations under any circumstances. The combination of these factors will pressure any administration to make the 2010s the post-interventionist decade.

In Asia, the Persian Gulf, and Western Europe—the core areas of American interest—this could, in fact, mark a second coming of the Nixon Doctrine. The Nixon Doctrine, most succinctly articulated in Richard Nixon's "Silent Majority" speech of November 1969, provided the basis for the most substantial reduction in American military spending since the end of the Second World War. The Nixon Doctrine called for the United States to honor its treaties, provide a nuclear umbrella against nuclear threats to its allies, and allow for the provision of military and economic assistance to allies to defend against aggression, while "[looking] to the nation directly threatened to assume the primary responsibility of providing the manpower for its defense."[70]

In the aftermath of the Vietnam War and the wake of the Nixon Doctrine, the US security position in East Asia did not collapse. Indeed, Nixon's political accommodation of the People's Republic of China in 1972 more than compensated for the "loss of Vietnam." Still under the American security umbrella, Japan continued to grow by leaps and bounds, and South Korea began its economic ascent. Soviet adventurism in Afghanistan and

concerns about the stability of the Persian Gulf led to the explicit, public identification of the Gulf as a vital US security interest. However, even here, the articulation of the so-called Carter Doctrine followed the framework of the East Asia–centric Nixon Doctrine in providing Saudi Arabia and other Gulf State allies with economic aid and sophisticated American military equipment rather than the stationing of US ground troops in the region. The Nixonian tradition of relying upon allies and proxies was taken substantially farther under the Reagan Doctrine that provided anti-communist resistance movements in Africa, Latin America, and Central Asia with training and material but likewise avoided the commitment of American armed forces. The increase in direct American interventions, including the extensive and expensive post–September 11 use of ground troops in Iraq and Afghanistan that has come with the end of the Cold War, stands in stark contrast to the post–Vietnam era of relative restraint.

Eugene Gholz argues that a return to the Nixon Doctrine would be a particularly suitable structure for relations with America's twenty-first-century East Asian allies.[71] Many of these allies—Japan and South Korea, as well as Taiwan—are among the richest and most technologically advanced countries in the world. The Philippines and Thailand, too, have dynamic economies and have weathered the international financial crisis and are recovering swiftly. Faced with the twin pressures of internal fiscal constraints and a relative erosion of our international economic position, an international strategy of security retrenchment, along with an intensification of diplomatic and economic engagement, is essential to maintaining the long-term interests of the United States. At the same time, the United States must be careful not to backslide into a position of simply "buck-passing" to its regional allies.[72]

This is a narrow path to navigate. Allies need to be concerned enough about US commitment that they invest in their own defensive capabilities but not so reassured that they either underinvest in security or, worse, engage in recklessly confrontational behavior, as the Georgian regime of Mikheil Saakashvili did with Russia in the summer of 2008. This can be done effectively if the extent of American guarantees and capabilities are clearly communicated. Some have argued that American military protection and expenditure is creating a culture of security dependence among our allies.[73] If these allies know the United States will always bail them out of their security dilemmas, they will have less incentive to invest in their own defense. While attention is often appropriately focused on the

negative incentives of a "culture of dependence" on the dependent, there are also adverse consequences for the provider, especially in terms of its relations with the dependent—the provider can become overbearing, demanding, and demeaning. A more circumscribed US security policy would reduce concerns about American dominance and give regional allies more control over their own security. In this regard, the movement in Korea toward a wartime Joint Forces Command under South Korean leadership, scheduled to take effect in 2015, is an example that could be replicated elsewhere, such as in the Mediterranean Sea, where responsibility and resources could be shifted to allied navies.

Elsewhere in the world, both the triumphs and tribulations of recent American experiences in Afghanistan, Iraq, and Libya can provide a guide to a successful manifestation of these ideas to future security situations. What is apparent from these three conflicts is that US military force was most efficiently used in circumstances where there was a local, indigenous ground force that could be supported by US high-technology air and naval assets. The success of the Northern Alliance in 2001 relied heavily on US air support but a minimal commitment of ground forces.[74] The "ragtag" Libyan insurrectionists, backed by precision-guided munitions of NATO and a de facto blockade of Libya, were able to first defend themselves and then mount successful offensives against the beleaguered Qaddafi regime. In Iraq, the most quiescent region was Iraqi Kurdistan, where external aid supported the Kurdish Regional Government (KRG). Kurdish political parties, economic development, and militias (*peshmerga*) provided effective governance over the region.[75] Finally, while the "surge" is often credited with turning the tide in the Iraqi counterinsurgency, it was, in fact, the Anbar Awakening and the co-optation of local tribesmen in Anbar province that stabilized the province and ensured success against al-Qaeda in Iraq.[76]

The United States' comparative security advantages are not in learning local languages and customs and in the deployment of tens or even hundreds of thousands of counterinsurgency forces. Its successes in these areas have been expensive, painful, and hard fought. But they do not come naturally or play to US strengths. While the United States can retain capacities in these areas and generate greater capacities if short-term needs arise, its long-term advantages are in mobile, capital-intensive, high-technology weapons systems that can be deployed on relatively short notice, as well as the sophisticated use of information technology for intelligence, surveillance, and cyber systems. Recognition of these require-

ments can be seen in President Obama's "Pivot to the Pacific" in his recent strategic guidance for the Department of Defense that sees American interests "rebalance towards the Asia-Pacific region."[77] With the ground wars in Iraq and Afghanistan receding, the Army and Marines will experience the most substantial downsizing.[78]

Rather than explicit commitments to rigid alliances, US security interests will likely be best promoted through partnerships with other countries—joint exercises, training operations, and exchanges. This has the advantage of encouraging interoperability, trust building, experience in different environments, and capacity development.[79] The new US Marine and Air Force presence outside of Darwin, Australia, can be seen as a means of developing just these capacities. Outside any immediate zones of potential conflict in south and east Asia, this new Pacific presence will be centered around a combined arms training base on Bradshaw Range encompassing an area the size of the state of Connecticut.[80] At the same time, it spares the United States the expense of maintaining large-standing overseas forces and relieves US policymakers of the burdens and consequences of explicit security guarantees that risk creating defense protectorates.[81]

American diplomatic activities would need to be upgraded to encourage US allies to cooperate more closely with one another and seek multilateral, regional, and international solutions to security issues. The United States is fundamentally a status quo power, and any strategy it pursues will need to be one that either co-opts or accommodates potential challengers to the status quo. Fortunately, the main potential challenger, China, has been successful precisely within this American-created system.[82] The various paths to resolving difficult security problems—such as the North Korean and Iranian nuclear programs, as well as many important economic issues—run, at least in part, through Beijing.[83]

Compared to the Soviet Union—which controlled a large nation-state with hundreds of millions of inhabitants and a network of state allies with millions of additional citizens, an advanced industrial base, a universalistic ideology, a highly advanced conventional military on the borders of our closest allies in Europe, the Middle East, and East Asia, and to top it off, possessed tens of thousands of nuclear weapons with reliable delivery vehicles that could destroy our entire way of life—the threats we face now are relatively modest. Al-Qaeda and similar terrorist organizations do not even control a state; Iran is a regional threat balanced by powerfully armed neighbors, while North Korea's greatest threat is probably that its regime

will collapse. That is not to say these threats should be ignored, but they should be kept in perspective as the United States enters an era where there will be strong fiscal pressures for an international strategy that is less directly engaged.

Likewise, it is worth stressing that moving to a policy of fiscal and military retrenchment at home coupled with a return of a New Nixon Doctrine abroad is a far cry from isolationism and disengagement. It is important to emphasize that a decrease in resources and commitments does not mean no commitments, nor does it mean nonengagement, and it certainly does not mean the United States will no longer be the pre-eminent power in the world. It does mean a recognition that the period Charles Krauthammer termed the "unipolar moment" is over.[84] Indeed, a New Nixon Doctrine would necessitate a high degree of diplomatic engagement to encourage and bolster the positions of our regional allies and partners. It would also mean a greater expenditure of diplomatic effort to encourage other countries to be more involved in supporting multilateral actions. This would have the added advantages of enhanced international legitimacy and a removal of any potential stigma that direct US military intervention might create.

The United States retains immense advantages over every other potential peer competitor and any nonstate threats to international stability. However, while we can remain the most influential country in the world, we cannot remain the dominant country in the international system. Furthermore, attempts to preserve that position can be counterproductive. This would be especially true for any foreign engagement that involved a sizable number of US ground forces, as those interventions are financially the most expensive to sustain and the most difficult to terminate. In addition to recognizing the limitations of the likely future fiscal and security environment, bringing back the Nixon Doctrine plays to and preserves the existing and enduring strengths of the United States. These include its centrality to the international system of trade and monetary relations, its existing network of long-term alliances, and its technological and military strength. These are immense advantages, and the United States should play to them. Many of the consequences of the United States' adjustment to its looming budgetary reality are uncertain. What is certain though is that fiscal considerations will significantly fetter any long-term US security strategy. **SSQ**

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US Extended Deterrence

How Much Strategic Force Is Too Little?

David J. Trachtenberg

In of the second decade of the twenty-first century, the United States finds itself on the cusp of what might be called the third atomic age. The first coincided with the Cold War, which saw the United States transition from a nuclear weapons monopoly to a superpower seeking to restore parity to the strategic balance in the wake of the Soviet Union's development and deployment of a massive, powerful, and extensive nuclear weapons capability.

The second atomic age emerged with the disintegration of the Soviet Union, ending the Cold War. It was characterized by a period of re-assessment and restructuring of US nuclear policies and forces to adapt to a security environment that had changed dramatically and unexpectedly.

Today, a third atomic age is developing in which the role of nuclear weapons in US national security strategy continues to diminish and the nuclear forces supporting that strategy shrink to historically low levels. However, the global proliferation of nuclear weapons and technologies has led others to move in the opposite direction—seeking to acquire the very nuclear weapons that many in the West view as increasingly irrelevant to contemporary security challenges. The potential ramifications of this development have led some analysts to suggest the world is now at a nuclear "tipping point."

Throughout the Cold War and post–Cold War periods, the United States relied ultimately on its nuclear potential to deter aggression. During the Cold War, the primary mission of US nuclear forces was to deter the Soviet Union. In the early part of this era, US policy makers postulated that deterrence could be effectively maintained with a nuclear capability sufficient to inflict a level of damage to the Soviets' industrial capacity and

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population that they would deem unacceptable. This "deterrence by punishment" calculus formed the basis of force sizing and planning for the US nuclear arsenal for years to come. Yet, a central fallacy in this approach was that it relied on *American* perceptions of what the Soviets would find "unacceptable" rather than definitive knowledge of what they themselves would consider sufficient to deter.

The debate over extended deterrence is similarly challenged by a need to understand that its effectiveness depends on how both allies and adversaries perceive the credibility of US commitments. American views of how others *should* perceive the credibility of US nuclear threats are less relevant than how others *actually* perceive them. Moreover, the views of allies and adversaries can vary widely, based on historical, cultural, and other unique circumstances.

As the nature of nuclear threats evolved, the US nuclear force structure and size also evolved. With the demise of the Soviet Union, the missions and purposes of US nuclear forces were increasingly called into question. This included not only their utility for deterring direct attack on the United States but also the efficacy of extending nuclear deterrence to third parties to prevent aggression by others.

The Bush administration's 2001 *Nuclear Posture Review* (*NPR*) postulated a world of extant and emerging nuclear powers posing qualitatively different nuclear threats to the United States and its allies than existed during the Cold War. While deterrence of nuclear attack remained a central goal of US nuclear forces, its nuclear arsenal was considered to play a broader role in ensuring global security.

Along with traditional deterrence, the 2001 *NPR* articulated a role for nuclear weapons in "assurance, dissuasion, and defeat"—concepts previously posited in the 2001 *Quadrennial Defense Review*. In other words, the *NPR* acknowledged that US nuclear forces play a major role in providing security guarantees to friends and allies who lack their own nuclear weapons and face challenges from hostile neighbors or adversaries (i.e., assurance). The US nuclear potential was also seen as having a dissuasive effect on adversaries who might contemplate actions contrary to American interests. And, of course, should deterrence fail—an increasingly plausible prospect in a world of rogue states and terrorist actors—US nuclear forces must have the capacity to defeat any aggressor. Without this capacity, the credibility of the US nuclear deterrent might be called into question, undermining the central deterrence goal of its nuclear forces.

This article focuses on the assurance aspect of US nuclear forces—helping to assure friends and allies of the American commitment to their security. There are many ways to assure friends and allies, and not all rely on threatening potential aggressors with nuclear destruction. These can include declaratory policy, creating or strengthening mutual defense agreements and military alliances, fostering broader political relationships, bolstering reliance on missile defenses, and the forward deployment of conventional forces.[1]

None of these means is mutually exclusive, and a sound policy of assurance will deploy all of them, as appropriate, tailored to specific circumstances. Nevertheless, it is the nuclear deterrence aspect of assurance which is being questioned more widely as nuclear force levels are reduced and which is the focus of this article.

Importantly, the requirements for extended deterrence and assurance may not be identical. An adversary may be deterred from attacking an ally even though that ally does not perceive its security to be adequately "assured." Therefore, in some cases, the requirements for assurance may exceed those of deterrence. Clearly, the answer to the question How much is enough (or too little)? depends on the perception of both allies and adversaries.[2]

In light of growing threats to the United States posed by the proliferation of nuclear and other weapons of mass destruction (WMD) capabilities to potential adversaries, the efficacy of security guarantees also depends on how allies perceive US willingness to defend their security if doing so risks exposing the US homeland to direct attack.

By extending its nuclear deterrent to other countries, the United States has historically provided a "nuclear umbrella" under which it sought to ensure their security. The prospect of a nuclear response by the United States to a third-party attack using nuclear or other WMDs on an ally has for decades added a degree of uncertainty to the calculations of potential adversaries contemplating such aggression. However, in a world of proliferating nuclear powers, renewed American emphasis on arms control and further nuclear reductions and growing tensions between US policies that support elimination of nuclear weapons entirely and adversaries who increasingly seek them, the continued viability and credibility of the extended deterrent deserves closer examination.

Some questions this article addresses include:

- How has extended deterrence worked in the past, and what are the factors that influence its viability?

- Is there a link between extended deterrence and nonproliferation?

- How do allies in Europe and Asia perceive the requirements of extended deterrence?

- Is the size of the US nuclear arsenal more relevant to extended deterrence than its composition?

- Are there alternatives to the extended deterrence provided by US nuclear forces that can provide the same degree of assurance to friends and allies?

- What impact do nuclear reductions have on the ability of the United States to reassure allies of the credibility of its security guarantees?

- What are the implications for extended deterrence of current US nuclear policies?

- And, as US nuclear forces are reduced, is there some threshold level of capability beneath which the risks of aggression exceed the ability to deter it?

History of Extended Deterrence

At the dawn of the nuclear age, the United States confronted a numerically superior conventional army that had occupied the eastern half of Europe after World War II. As Cold War attitudes hardened and Soviet expansionist objectives became clearer, the United States sought to deter Soviet aggression by extending its nuclear deterrent abroad. The threat of an American nuclear response to a conventional invasion of Western Europe was integrated into US military doctrine in the postwar era.

At a time when the United States possessed nuclear superiority over the Soviet Union, this extended deterrent was perceived as a credible threat sufficient to deter any move west by the Red Army. As the Soviets approached nuclear parity and then surpassed the United States in overall levels and capabilities of its nuclear forces, the credibility of US threats to "go nuclear" to protect Western Europe against Soviet aggression became debatable.

Nevertheless, despite changes in the balance of nuclear forces between the two superpowers in the 1960s and 1970s, the US nuclear arsenal remained sizable enough to give pause to any aggressor. At its peak, the United States deployed more than 10,000 strategic and nonstrategic (i.e., tactical) nuclear weapons on more than 2,000 delivery platforms. Although the Soviets maintained some significant advantages in nuclear firepower, throw weight, and other measures of nuclear capability, the sheer size of the American nuclear arsenal was thought by some to have an "existential" deterrent effect.[3]

As arms control became a central element of the bilateral superpower relationship, pressures emerged to reduce the size of nuclear stockpiles. Along with the Strategic Arms Limitations Talks (SALT) and Strategic Arms Reductions Talks (START), which resulted in treaties reducing the number of long-range nuclear weapons systems, the 1986 Intermediate-Range Nuclear Forces (INF) Treaty resulted for the first time in the negotiated elimination of an entire class of nuclear weapons delivery systems. This included the Pershing II ballistic and ground-launched cruise missiles (GLCM) deployed in Europe that were a visible part of the US extended deterrence commitment.

Extended deterrence was not limited to protecting European allies. For example, as Japan became one of the strongest postwar allies of the United States, the emerging nuclear weapons potential of first China and then North Korea concerned Japanese officials, who became acutely sensitive to the role of the US nuclear umbrella in assuring Japan's security.

After the Korean armistice in 1953, South Korea also enjoyed a degree of protection accorded by the American extended nuclear deterrent. US nuclear weapons were stationed on South Korean territory. The painful shadow of Vietnam, however, and the fall of the Saigon government in 1975 led to questions about whether the United States would rather accept defeat in war than resort to the use of nuclear weapons.

Since then, the United States has deployed veiled nuclear threats in limited circumstances to bolster deterrence. For example, then secretary of state James Baker articulated such a threat to Saddam Hussein in an effort to deter the Iraqi dictator from using WMDs against coalition forces in the 1991 Gulf War. Even though Secretary Baker later admitted the United States had no intention of using nuclear weapons, the possibility they might be used was arguably a consideration in Saddam's decision not to launch chemical or biological attacks against Israel or coalition forces.

The importance of extended deterrence has been recognized even by those who favor the ultimate elimination of the nuclear capabilities on which it rests. Speaking in Prague in April 2009, President Obama reiterated his vision for a nuclear-free world but noted, "As long as these weapons exist, the United States will maintain a safe, secure, and effective arsenal to deter any adversary, *and guarantee that defense to our allies*"[4] (emphasis added). Today, however, as nuclear weapons increasingly are seen by some decision leaders as weapons that serve no purpose, will never be used in combat, and should be eliminated, the credibility of US nuclear threats is likely to be diminished in the eyes of both potential adversaries and long-time friends and allies.

The Relationship between Extended Deterrence and Nonproliferation

For a number of states, their own security rests on the viability and credibility of US nuclear assurances. Without the assurance—or reassurance—that this nuclear umbrella provides, these states may pursue their own nuclear weapons acquisition programs. As one observer noted, "For allies such as Japan, South Korea and Taiwan, and some NATO states, the stability both of the US deterrent and extended deterrence guarantees are a significant part of these countries' own strategic calculus."[5] Indeed, there have been numerous studies in recent years suggesting "the credibility and reliability of US nuclear assurances are necessary to keep countries . . . from reconsidering their decisions to be nonnuclear states."[6]

In a 2007 study that linked US extended deterrence with nonproliferation, the State Department's International Security Advisory Board (ISAB) concluded, "Nuclear umbrella security agreements, whether unilateral or multilateral, have been, and are expected to continue to be, effective deterrents to proliferation."[7] The ISAB report stated, "There is clear evidence in diplomatic channels that US assurances to include the nuclear umbrella have been, and continue to be, the single most important reason many allies have foresworn nuclear weapons," and further suggested that "a lessening of the US nuclear umbrella could very well trigger a [nuclear proliferation] cascade in East Asia and the Middle East."[8]

Former secretary of defense Robert Gates acknowledged the importance of US nuclear weapons to extended deterrence and nonproliferation. In a 2008 speech to the Carnegie Endowment for International Peace,

he declared, "As long as others have nuclear weapons, we must maintain some level of these weapons ourselves to deter potential adversaries and to reassure over two dozen allies and partners who rely on our nuclear umbrella for their security, making it unnecessary for them to develop their own."[9]

In 2009, the bipartisan Commission on the Strategic Posture of the United States concluded, "The US nuclear posture must be designed to address a very broad set of US objectives, including not just deterrence of enemies in time of crisis and war but also assurance of our allies and dissuasion of potential adversaries. Indeed, the assurance function of the force is as important as ever."[10]

By some estimates, nearly 30 countries rely on the extended deterrent for the ultimate security US nuclear forces provide. Some of these countries are strong US allies that do not feel sufficiently threatened by neighbors or adversaries to contemplate developing nuclear weapons of their own. Others have been dissuaded from doing so as a result of formal defensive alliances with the United States (such as NATO). Still others are friends with which the United States does not have a formal defense relationship but whose security is nevertheless important to the maintenance of stability and defense of American interests; therefore, the nuclear umbrella has been extended to them.

Many of these countries can be found in dangerous or unstable regions with potentially hostile neighbors. If the US extended nuclear deterrent loses credibility, it is most likely to have significant repercussions among those states who may determine that their security is best served by acquiring their own nuclear weapons capability.

Allied Views of Assurance

The role of US nuclear forces in extending deterrence to NATO allies is codified in NATO's *Strategic Concept*, promulgated in 2010. The document states, "The supreme guarantee of the security of the Allies is provided by the strategic nuclear forces of the Alliance, particularly those of the United States." In addition, NATO's strategy for deterrence will continue to be based "on an appropriate mix of nuclear and conventional capabilities."

What constitutes an "appropriate mix" is a matter to be determined by the NATO members themselves. However, the *Strategic Concept* notes, "As long as nuclear weapons exist, NATO will remain a nuclear alliance."

Further, the document is clear on the inseparability of European and American security, noting that "the transatlantic link remains as strong, and as important to the preservation of Euro-Atlantic peace and security, as ever."[11]

The issue of extended deterrence and the role of US nuclear forces in providing that deterrence to NATO is not without controversy. Nevertheless, it is clear a number of US, NATO, and non-NATO allies consider the US extended deterrent to be critical to their security.[12] A group including former military chiefs of the United States, Britain, France, Germany, and the Netherlands reaffirmed the importance of the extended deterrent role of US nuclear forces and the credibility of nuclear escalatory threats by noting, "The first use of nuclear weapons must remain in the quiver of escalation as the ultimate instrument to prevent the use of weapons of mass destruction, in order to avoid truly existential dangers."[13]

For some, the value of the extended deterrent lies in the deployment of American nuclear weapons on their territory and the demonstration of resolve these deployments convey. In these cases, additional US strategic offensive arms reductions may have less significance on allied perceptions of American credibility. For others, the value of extended deterrence lies more in the ability and willingness of the United States to maintain the effectiveness of its strategic nuclear arsenal. Therefore, additional strategic arms reductions may undermine the assurance value of American security guarantees.

In the past, some US allies have expressed strong views regarding the extended deterrent. These include non-NATO allies. For example, according to documents recently declassified by Japanese officials, concern over a possible Sino-US conflict in the mid 1960s led Prime Minister Sato Eisaku to press Secretary of Defense Robert McNamara for assurances the United States would be prepared to use its nuclear weapons against China.

In the wake of China's nuclear testing, Secretary McNamara subsequently expressed concern that without reassuring Japan of the US commitment to its security, Tokyo might seek its own nuclear weapons. Since then, other Japanese officials have sought similar American nuclear assurances, including comments by Foreign Minister Aso Taro after North Korea's nuclear test in 2006.[14] Apparently, South Korea also sought nuclear assurances from the United States after that nuclear test.[15] Former South Korean defense ministers reportedly approached the United States seeking the redeployment of nuclear weapons in South Korea that had been previously withdrawn.[16]

In June 2009, President Obama and South Korean president Lee Myung-bak reaffirmed that the US–Republic of Korea security relationship included the "continuing commitment of extended deterrence, including the US nuclear umbrella."[17] During a subsequent visit to Seoul, Secretary of Defense Gates declared, "The United States is committed to providing extended deterrence using the full range of American military might" to protect South Korea, including "the nuclear umbrella."[18]

Obviously, allied views of extended deterrence will be shaped not only by what the United States does with respect to its nuclear forces but also by the evolving global strategic situation. Although the Cold War division of Europe ended more than two decades ago, some allies in Europe grow increasingly concerned over what they perceive as a renewed aggressiveness in Russia's foreign and defense policies. The Russian military action in the summer of 2008 against Georgia—a country seeking NATO membership—suggested that extending US nuclear guarantees to countries on Russia's periphery might be risky business. It also raised additional uncertainties on the part of Russia's other neighbors regarding the credibility of US security guarantees.

On top of this, Russia has revised its military doctrine to place increased reliance on its nuclear forces, continued to pursue an aggressive nuclear weapons modernization program, resumed Cold War–style exercises of its strategic nuclear forces, threatened some of its former satellite states with nuclear attack, and publicly proposed developing new "offensive weapons systems" to counter the United States.[19]

In the wake of Russian statements and actions, the concerns of Russia's neighbors and their desire to be integrated into the security perimeter of the United States are understandable. So, too, is concern that Washington's desire to "reset" its relationship with Moscow in the wake of Russia's increasing assertiveness may actually lead others to question the attractiveness of, and confidence in, American security guarantees.

Ukraine, a former Soviet state, has been wary of Russia and, until recently, sought the security guarantees that would accrue to it from NATO membership. Yet, after 2010, the new Ukrainian government changed course from its predecessor, declaring Kiev's preference for neutrality and nonalignment, rejecting the previous government's push for NATO membership, and seeking greater accommodation with Russia.[20]

As more countries pursue the path to NATO membership, the United States will likely find itself extending its nuclear umbrella to additional

states in what was formerly viewed as Russia's "sphere of influence." Future reductions in European-based US tactical nuclear forces, along with NATO's prior assurances to Russia that new NATO members would not host US nuclear weapons on their territories,[21] may complicate the mission of extended deterrence. Indeed, when coupled with the movement toward significant reductions in US strategic nuclear forces, it may become increasingly difficult to explain credibly how nuclear deterrence can be effectively extended to a greater number of states at a lower level of forces.

In Asia, the developing nuclear capabilities of North Korea have also sparked concern among America's regional friends and allies. Japan, in particular, has encouraged the United States not to back away from its extended nuclear deterrent. After North Korea's 2006 nuclear test, one Japanese press report stated that "Defense Minister Fumio Kyuma spoke in no uncertain terms about strengthening the deterrence of US nuclear weapons. The strongest deterrence would be when the United States explicitly says, 'If you drop one nuclear bomb on Japan, the United States will retaliate by dropping 10 on you,' he said."[22]

Japan has been particularly sensitive over the credibility of US security guarantees. Japan's 2004 Defense Program Outline declared, "To protect its territory and people against the threat of nuclear weapons, Japan will continue to rely on the US nuclear deterrent," a posture explicitly reflected in the country's official Defense Program Outline since 1976.[23] The "National Defense Program Outline for Fiscal [Year] 2011 and Beyond" reportedly emphasizes that "extended deterrence provided by the United States, with nuclear deterrence as a vital element, will be indispensable."[24] A US-Japan joint statement issued after a meeting of the bilateral Security Consultative Committee in May 2007 reaffirmed that "US extended deterrence underpins the defense of Japan and regional security," and this includes "the full range of US military capabilities—both nuclear and nonnuclear strike forces and defensive capabilities."[25]

Yukio Satoh, vice-chairman of the Japan Institute of International Affairs and former diplomat, expressed Japan's views regarding US extended deterrence by noting:

> The importance for Japan of the American nuclear deterrence has increased since the end of the Cold War, as the country has become exposed to a diversity of conceivable nuclear threats, such as North Korea's progressing nuclear and missile programs, China's growing military power, and Russia's strategic reassertiveness. These developments are making Japan increasingly vulnerable to possible or potential

threats by nuclear and other weapons of mass destruction (WMD). Ensuring American commitment to extend deterrence against such threats is therefore a matter of primary strategic importance for Japan. . . .

In recent years, the Japanese have become growingly sensitive to the credibility of the American commitment. Exposed to a series of dangerous actions by Pyongyang, particularly its test-shooting of a missile over Japan in 1998, its nuclear testing in 2006, and yet another test of a long-range missile, the Japanese have come to realize anew the importance of the American extended deterrence for their security, and this has made the Japanese more sensitive than ever to Washington's attitude to North Korea.[26]

Ambassador Satoh, a supporter of the "Global Zero" movement to eliminate nuclear weapons, also recognized the potential hazards the move toward nuclear disarmament could pose for Japanese security, noting,

Even the propositions advocated by eminent American strategists to pursue "a world free of nuclear weapons" have given rise to some anxiety about the possible negative impact on the American extended deterrence. . . . Furthermore, the Japanese concern about the credibility of the American extended deterrence could increase if the US government were to unilaterally move to redefine the concept of nuclear deterrence, particularly to reduce dependence upon nuclear weapons in providing deterrence, without proper consultations. . . .

There have been no official consultations between Washington and Tokyo on how American extended deterrence should function, nor even any mechanism put in place for such consultations. . . . The time has come for us to create some kind of mechanism through which we can discuss the common strategy, particularly if the United States is going to reduce dependence upon nuclear weapons in their strategy.[27]

Does Size Matter?

Assurance considerations may be affected not only by the size of the American extended nuclear deterrent but also by its composition. Some countries may not consider additional numerical reductions in US strategic nuclear forces to be especially significant with respect to the credibility of security guarantees unless those reductions impact the levels or operational utility of the types of nuclear forces those countries consider most useful to deter threats to their security.

For example, the threatened use of land-based ICBMs deployed on American soil in defense of allies may be seen as less credible than SLBMs on submarines that can deploy to crisis areas, especially since a strike using

forces based in the United States may increase the risk of direct retaliation against the US homeland. For this reason, allies may consider the United States less willing to come to their defense by employing its central strategic forces. Bombers, however, may provide the highest level of reassurance to allies since, unlike ICBMs, they are mobile and, unlike nuclear ballistic missile–armed submarines (SSBN), they are visible. The bomber leg of the strategic triad is the most flexible for signaling intentions, which can provide reassurance to allies in times of crisis.

The overall level of US strategic nuclear forces may convey to allies a sense of how the United States views the relevance of these forces in the contemporary security environment. Strategic force reductions pursued, for example, as part of a bilateral US-Russia effort to diminish reliance on nuclear weapons for strategic deterrence purposes may have unintended negative consequences for assurance and extended deterrence.

The Role of Strategic and Nonstrategic Nuclear Forces in Extended Deterrence

Discussions of "strategic" and "nonstrategic" nuclear forces tend to obscure the fact that for the countries whose security depends on them, all nuclear weapons are strategic. The distinction is somewhat artificial and was derived to conform to an arms-control process that focused on regulating arsenals based on the range of their delivery systems. Nevertheless, both longer-range and shorter-range systems have relevance for extended deterrence.

Today, the United States maintains a minimum number of nonstrategic nuclear weapons in Europe. Most European-based US nuclear forces were removed as a result of the 1986 INF Treaty, which eliminated the Pershing II missile and GLCMs, or the 1991 Presidential Nuclear Initiative (PNI), which led to the withdrawal of nuclear artillery shells, naval anti-submarine nuclear weapons, and short-range ballistic missile nuclear warheads.[28] In 1971, 11 types of nuclear weapons systems were deployed in Europe.[29] Today, the number of nonstrategic nuclear weapons in NATO Europe has been reduced by more than 97 percent from 1970 levels. The only remaining US nuclear weapons in Europe are air-delivered gravity bombs that reportedly can be deployed on dual-capable aircraft in Turkey, Italy, Germany, Belgium, and the Netherlands. Deployment of these non-strategic nuclear weapons has always been seen as a means of reinforcing

America's extended nuclear deterrent by providing a critical link between conventional forces in Europe and US strategic nuclear forces. They have also provided a visible and tangible expression of American solidarity with host countries, which some believe has strengthened their deterrent value.

The importance of maintaining US nonstrategic nuclear forces in Europe was highlighted in a 2008 report by the Secretary of Defense Task Force on DoD Nuclear Weapons Management, which noted,

> The Allies believe in the US nuclear deterrent as a pillar of the Alliance. Some Allies have been troubled to learn that during the last decade some senior US military leaders have advocated for the unilateral removal of US nuclear weapons from Europe.

> These Allies are convinced that the security of the United States is "coupled" to that of Europe. Moreover, these allies are aware of the greater symbolic and political value of allied aircraft employing US nuclear weapons. . . .

> USEUCOM (US European Command) argues that an "over the horizon" strategic capability is just as credible. It believes there is no military downside to the unilateral withdrawal of nuclear weapons from Europe. This attitude fails to comprehend— and therefore undermines—the political value our friends and allies place on these weapons, the political costs of withdrawal, and the psychological impact of their visible presence as well as the security linkages they provide. . . .

> DCA (dual-capable aircraft) fighters and nuclear weapons are visible, capable, recall-able, reusable, and flexible and are a military statement of NATO and US political will. These NATO forces provide a number of advantages to the Alliance that go far beyond USEUCOM's narrow perception of their military utility. Nuclear weapons in Europe provide a continuous deterrence element; as long as our allies value their political contribution, the United States is obligated to provide and maintain the nuclear weapon capability.[30]

Should these forces be withdrawn completely, the willingness of the United States to "go nuclear" on Europe's behalf could be called into question. It could also place increasing stress on US strategic nuclear forces by adding additional mission responsibilities (especially if the number of countries protected under the nuclear umbrella continues to increase as a result of NATO enlargement) at a time when those forces are also likely to decline further.

It is plausible the requirements of extended deterrence may also necessitate the retention of certain types of nuclear forces that might otherwise be withdrawn or retired. As the Congressional Commission on the Strategic Posture of the United States noted, "Assurance [of allies] that

extended deterrence remains credible and effective may require that the United States retain numbers or types of nuclear capabilities that it might not deem necessary if it were concerned only with its own defense."[31] The commission also reported some European allies believe modernization of European-based nuclear forces is "essential to prevent nuclear coercion by Moscow" and for "restoring a sense of balance" in the face of Russia's nuclear modernization efforts.[32] In addition, Turkey has reportedly been concerned over the potential removal of nuclear gravity bombs that can be carried by dual-capable aircraft based on its territory. In August 2009, Turkish officials reportedly expressed concern that Iran's efforts to acquire nuclear weapons would lead Turkey to do the same.[33]

Some Asian officials have expressed particular concern over the potential elimination of the TLAM-N cruise missile, one of the few nonstrategic nuclear weapons remaining in the US nuclear arsenal. This was noted by the congressional commission.[34] One account of concerns expressed by a "particularly important ally" indicated that should the United States decide to eliminate TLAM-N, "we would like to be consulted in advance with regard to how the loss of this capability for extended deterrence will be offset."[35] Additionally, the commission noted the views of one ally, expressed privately, that "the credibility of the US extended deterrent depends on its specific capabilities to hold a wide variety of targets at risk, and to deploy forces in a way that is either visible or stealthy, as circumstances may demand."[36]

Some analysts have suggested that the TLAM-N has little military utility and its importance to countries like Japan is overstated. One challenged the Strategic Posture Commission's conclusions in this regard, calling the notion that TLAM-N is critical to extended deterrence in Asia "odd."[37] In particular, the deployment of other capabilities to the Pacific region, including aircraft carriers, submarines, and long-range bombers, is seen by some as a sufficient deterrent to aggression.

As one analyst noted, "Why, given these extensive US forces earmarked for the Pacific region, anyone in Tokyo, Washington, Beijing, or Pyongyang would doubt the US capability to project a nuclear umbrella over Japan—or see the TLAM-N as essential—is puzzling."[38] Such reasoning, however, reflects a decidedly *American* perspective based on *American* views of what *should* be reassuring to allies. But clearly, reassurance is in the eye of the reassured, and allied views may differ from ours, based on unique historical, cultural, or other factors. These factors should be taken

into account if the purpose of the US extended deterrent is to reassure allies of the US commitment to their security.

Since the change in Japan's government in 2009, questions have been raised about that country's views of the importance of the TLAM-N for extended deterrence. Japan's former foreign minister Katsuya Okada noted, "The Japanese government is not in a position to judge whether it is necessary or desirable for [the US] government to possess particular [weapons] systems. . . . Nevertheless, if TLAM-N is retired, we hope to receive ongoing explanations of [the US] government's extended deterrence policy, including any impact this might have on extended deterrence for Japan and how this could be supplemented."[39]

Indeed, as articulated in the 2010 *Nuclear Posture Review Report*, the Obama administration decided to retire the TLAM-N, arguing that it "serves a redundant purpose in the US nuclear stockpile," and its deterrence and assurance roles "can be adequately substituted" by other means, including forward-deployed aircraft and central strategic forces.[40] Consequently, all TLAM-N missiles are expected to be retired by 2013. At the same time, however, the administration has declared "no changes to US extended deterrence capabilities will be made without continued close consultation with allies and partners."[41]

With respect to the continued deployment of nonstrategic nuclear forces in Europe, the Obama administration's April 2010 *Nuclear Posture Review Report* argues such decisions should be made in consultation with NATO allies and says the United States "is committed to making consensus decisions through NATO processes."[42] Moreover, it declares, "Any changes in NATO's nuclear posture should only be taken after a thorough review within—and decision by—the Alliance."[43]

Despite the expressed US commitment to consult closely with countries that benefit from its extended deterrent, some observers have argued the views of allies should not drive the United States to maintain nuclear weapons that have little military utility. They argue that doing so would essentially hold American nuclear deployments "hostage" to the whims of other countries.[44] Nevertheless, it is clear American strategic interests are best served by considering allied views—though these views may not be determinative—prior to any future decisions regarding the appropriate level or composition of US nuclear forces.

Although a number of European and Asian allies share similar views of the importance of extended deterrence, there are also important nuances.

For example, European allies in general put great value in the deployment of US nonstrategic nuclear weapons on European soil, whereas a number of Asian allies would prefer to keep US nuclear weapons, both strategic and nonstrategic, "on call."[45]

Extending Deterrence by Other Means

Extended nuclear deterrence worked well during the Cold War. NATO's deployment of US nuclear weapons on European soil, coupled with its refusal to preclude the first use of nuclear weapons in response to Soviet conventional aggression, arguably helped convince Soviet leaders of the seriousness of America's nuclear guarantees to its European allies. In the post–Cold War world, however, some have questioned the value of extended deterrence, suggesting other alternatives can deliver the deterrent value US nuclear forces once provided.

Third-Party Nuclear Capabilities

In the European context, both the UK and France maintain their own independent nuclear forces and could presumably extend their nuclear deterrent to the rest of Europe. However, neither country is likely to do so for a variety of political and strategic reasons. These include the difficulty of persuading their populations to use their independent nuclear deterrents not only to protect their own citizens but other European countries as well, especially in a post–Cold War world where pressures to reduce reliance on nuclear forces continue to mount.

UK strategic policy continues to reflect the need for nuclear deterrence, albeit at lower force levels, and recognition that British nuclear weapons can play an important role in NATO's collective security. *The Strategic Defence and Security Review* submitted by Prime Minister David Cameron to Parliament in October 2010 declares that the United Kingdom "can meet the minimum requirement of an effective and credible level of deterrence with a smaller nuclear weapons capability." To this end, the UK plans to "reduce our requirement for operationally available warheads from fewer than 160 to no more than 120."[46]

The British government's 2006 white paper recognized its nuclear forces have been reduced by 75 percent since the end of the Cold War.[47] Former prime minister Gordon Brown, in a July 2009 report to Parliament, noted a "minimum nuclear deterrent remains an essential element of our

national security" and declared Britain "will continue to contribute our strategic nuclear deterrent to NATO's collective security," but added that the UK "would only consider using nuclear weapons in self-defense (including the defense of our NATO allies), and even then only in extreme circumstances."[48] This was reaffirmed by the 2010 *Strategic Defence and Security Review*, which stated, "The U.K. has long been clear that we would only consider using our nuclear weapons in extreme circumstances of self-defence, including the defence of our NATO Allies, and we remain deliberately ambiguous about precisely when, how, and at what scale we would contemplate their use."[49]

In his 2006 speech to the Strategic Air and Maritime Forces at Ile Longue, President Jacques Chirac reiterated the importance of France's nuclear deterrent, calling it "the ultimate guarantor of our security," and declared there should be no doubt "about our determination and capacity to resort to our nuclear weapons. The credible threat of their utilization permanently hangs over those leaders who harbor hostile intentions against us." But he also suggested defending France's vital interests could extend beyond the country's borders as a result of "the growing interdependence of European countries and also by the impact of globalization."

Chirac noted, "Safeguarding our strategic supplies or the defense of allied countries are, among others, interests that must be protected." He also declared France's nuclear deterrent to be "a core element in the security of the European continent."[50] Nevertheless, this statement was offered in the context of a NATO defense framework that continues to rely on American nuclear capabilities for extended deterrence. It was not meant to suggest French nuclear forces could substitute for American capabilities. Moreover, some European countries have in the past been disinclined to stake their own security on France's nuclear deterrent.[51] This may, in part, reflect political as well as military concerns.

As a practical matter, extending deterrence to European allies through exclusive reliance on the relatively small UK or French nuclear deterrents is unlikely to convey the same measure of credibility as using US nuclear forces. In addition, neither the British nor French nuclear capabilities are seen as sufficient to extend deterrence to Asian allies against a growing Chinese nuclear capability.[52]

Nonnuclear Capabilities

Some believe the contemporary strategic environment no longer requires American nuclear threats to be made on behalf of allies, if it ever did, and nonnuclear means can be equally effective as a deterrent to aggression. As a 2008 RAND paper argued, "The United States, even when resting extended deterrence almost entirely on nuclear weapons, was always extremely circumspect about even obliquely threatening their use; this was no less the case during the 1950s when it still retained a near monopoly on long-range nuclear weapons. At present, and for the near term, US conventional capabilities greatly reduce the need to rely on nuclear weapons for extended deterrence relative to the 1950s."[53]

Nuclear weapons deter by threatening severe punishment to a potential attacker. The effectiveness of this type of deterrence requires the ability to hold at risk those assets an adversary values most. Although in certain cases modern conventional weapons can accomplish military objectives once thought possible only by the use of nuclear weapons, they cannot substitute for nuclear weapons in all cases.

For example, potential adversaries like North Korea and Iran have placed their most valuable strategic assets underground, in highly protected areas, beyond the reach of conventional strike capabilities. Removing the threat of a nuclear retaliatory strike would grant sanctuary to those assets or capabilities that could no longer be held at risk. Rather than deter aggression, this might provoke it if an adversary believes its most valuable assets could be spared from destruction. Some of the bloodiest conflicts in history, including two conventional world wars, were fought as a consequence of the failure of prenuclear deterrence. In the words of one analyst, "The historical record of conventional deterrence is not encouraging."[54]

One reason to question the ability of conventional forces to substitute for nuclear in providing extended deterrence is that sufficient conventional forces may not be forward deployed in time to regions where they can function as an effective deterrent. Moreover, while the United States continues to seek a prompt global strike capability using nonnuclear weapons, those potential systems are not sufficiently mature to expect they can credibly serve the extended deterrence function that nuclear weapons do today.

In addition to the strictly military aspects of deterrence, psychological ones are at play as well. Nuclear weapons are perceived to be the ultimate weapons, and the punishment they can exact is without equal. The

psychological impact of a threat to employ a weapon with such significant damage potential may, in and of itself, bolster deterrence in ways the threat of conventional retaliation could not.

While the effectiveness of deterrence rests on the adversary's perception of the consequences of aggression and it is impossible to know with absolute certainty how an adversary perceives nuclear threats, it is nevertheless plausible that conventional deterrence alone will carry less impact than deterrent threats that include a nuclear component. As Gen Kevin Chilton, former commander of US Strategic Command, testified in 2010, "The nuclear weapon has a deterrent factor that far exceeds a conventional threat."[55]

Aside from reliance on nonnuclear weapons capabilities, it is possible that extended deterrence can be bolstered through a more robust American presence on allied territory. This can take the form of troop deployments, military facilities, or other types of visible linkages that bind friends and allies more tightly to the United States. However, the very visibility of an expanded American presence on the territories of sovereign states may also occasion negative political repercussions, especially in times of heightened tensions. Hence, the value of this means of assurance may be more susceptible to short-term fluctuations in internal host-nation politics that impact the credibility of American security guarantees.

Missile Defenses

In addition to the threat of punishment, deterrence can also be achieved through the ability to deny a potential attacker the objectives of its attack. This "deterrence through denial" strategy can be reflected in defensive measures—either as a substitute for or adjunct to—offensive retaliatory means.

The 2001 *NPR* reintroduced defenses into the calculus of deterrence by advocating the deployment of ballistic missile defenses. The ability to protect and defend against attack should deterrence fail was seen as a critical element of a sound nuclear strategy and a policy that reinforced deterrence by complementing the offensive threat of "punishment" with a defensive strategy of "denial." By adding strategic defenses to the deterrent mix, the 2001 *NPR* argued reliance on nuclear weapons could be reduced. This did not mean, however, that it could be eliminated entirely.

Ultimately, an adversary decides what best deters it from a particular course of action. For some aggressors, the threat of denial may be less of a deterrent than the threat of punishment. But it is impossible to know

with certainty what will work best in all circumstances and under all scenarios. Therefore, a prudent strategic posture should seek to maximize the effectiveness of deterrence by maintaining the capability to both punish and deny. Like advanced conventional weapons, missile defenses can be an important adjunct to a deterrence policy that includes nuclear weapons, but defenses alone cannot substitute for them.

Robustness of the Nuclear Enterprise

Regardless of whether nuclear deterrence relies on offensive punitive measures, defensive systems, or a combination of both, the capabilities to punish or deny must be viewed as credible to be effective. In large measure, the credibility of a nuclear deterrent arsenal lies not only in a willingness to employ it if necessary but in its perceived reliability—its ability to accomplish its mission if employed.

As the United States continues to abide by the unilateral nuclear test moratorium imposed two decades ago and as its nuclear arsenal continues to age, there has been a rising chorus of concern over the continued reliability and efficacy of that arsenal. Some observers have suggested American decisions over nuclear weapons modernization and sustainment of the US nuclear weapons enterprise have consequences for extended deterrence. While acknowledging the importance of the actual nuclear weapons in ensuring deterrence, viability of the nuclear weapons complex is also seen as central to ensuring deterrence.

As two Los Alamos National Laboratory officials put it, "It is not only the capabilities of the forces themselves that assure allies and deter potential adversaries, it is also the capability to sustain and modernize these forces, while also demonstrating that ability to rapidly respond to new or emerging threats."[56] This suggests a failure to modernize and adapt the US nuclear infrastructure to contemporary security threats may cast doubt on the credibility of the US extended deterrent.

A similar point was made in a study of extended deterrence published by the Center for Strategic and International Studies, which noted that

> perceived challenges to the credibility of US deterrence capabilities in the long term could have shorter-term consequences for assurance. Perceptions of the long-term viability of the US stockpile and infrastructure and of the prospects for a national consensus on the future of the US deterrent are salient factors affecting allies' confidence in the durability of the US commitment. Allies are paying close attention to American nuclear policy debates. Arguments from both sides of the

ideological divide can undermine assurance by skewing allies' perceptions of US intentions and capabilities.[57]

There is also some evidence to suggest European allies view the continued viability of the overall US nuclear enterprise to be more relevant to extended deterrence than either the levels or composition of US nuclear forces.[58] Indeed, the significant decline in the US strategic nuclear arsenal since the height of the Cold War, the removal of almost all nonstrategic nuclear forces in Europe, the suspension of underground nuclear testing, the loss of nuclear design and engineering competence and talent in the national laboratories, the congressional prohibitions on nuclear modernization, the aversion to any "new" nuclear weapons, and the general lack of attention to nuclear matters are symptomatic of a trend that suggests a diminished overall utility for nuclear weapons. These developments may also suggest to allies there is reason for additional concern over the efficacy of America's extended deterrent.

The Impact of the Obama Administration's Nuclear Policies

The Obama administration has made the global elimination of nuclear weapons a key national security goal. In the same Prague speech in which he reiterated the importance of extending nuclear deterrence to US allies, President Obama also declared the United States—as the only nation to have used nuclear weapons in anger—has a "moral responsibility" to work for their elimination. One year later, the president signed a "New START" treaty with Russia that would reduce the level of strategic nuclear offensive forces—both warheads and their associated delivery vehicles—to levels below those agreed to in the 2002 Strategic Offensive Reductions Treaty (i.e., the Moscow Treaty). In addition, he committed the administration to pursuing significantly lower levels of nuclear forces as part of a follow-on arms control agenda with Russia.

Subsequent to the signing of New START, the administration released its own nuclear posture review. This new, congressionally mandated NPR articulated the rationale and provided the underpinning for decisions that will affect the size and composition of the American nuclear arsenal over the next decade.

As expected, the 2010 *NPR* reaffirmed the importance of extended deterrence, noting, "The United States remains committed to providing a

credible extended deterrence posture and capabilities."[59] And it suggested a role for US central strategic forces in the extended deterrence mission. In particular, it stated that "nuclear-capable bombers are important to extended deterrence of potential attacks on US allies and partners. Unlike ICBMs and SLBMs, heavy bombers can be visibly forward deployed, thereby signaling US resolve and commitment in crisis."[60]

The 2010 *NPR*'s recognition of the role US central strategic forces can play in extending deterrence to allies and strategic partners raises the prospect that the demands on US nuclear forces may grow beyond the ability to meet them. This includes the possible extension of US nuclear guarantees to countries that heretofore have remained outside the formal protection of the US nuclear umbrella. In November 2008 it was reported the United States might extend an explicit nuclear guarantee to Israel in the event Iran acquired nuclear weapons.[61]

In July 2009, Secretary of State Hillary Clinton appeared to broaden that guarantee by stating the United States might consider extending "a defense umbrella" over the Middle East region as a deterrent to a nuclear-armed Iran.[62] Although she did not explicitly refer to an extended nuclear deterrent, the implication was clear and was seen as an attempt to dissuade countries in the region such as Saudi Arabia and other Gulf states from seeking nuclear weapons as a counterbalance to Iran's nuclear weapons potential.

It seems odd at a time when its nuclear forces are declining, the United States may consider extending its nuclear deterrent to other non-NATO states with which it has no formal alliances. The prospect of a nuclear-armed Iran has raised concerns among its immediate and regional neighbors. Countries like Saudi Arabia may feel threatened by a nuclear weapon in the hands of the leaders of the Islamic Republic.[63] A heightened level of insecurity among countries in this volatile region may propel some toward acquisition of their own indigenous nuclear weapons capability. Such a prospect would not only be a setback to US nonproliferation policy, but also could ignite regional tensions that threaten American friends and interests.

Seeking an Appropriate Nuclear Threshold

Global strategic developments and US policy may move the United States in a potentially risky direction. The proliferation of nuclear weapons and

technologies to dangerous actors is creating conditions where US allies and friends place greater stresses on, and increasingly question the credibility of, American security guarantees. For example,

- Additional European states seek security against a resurgent Russia through NATO membership that conveys the protection of the American nuclear umbrella;

- US allies in Asia are wary of China's nuclear modernization programs, as it increasingly invests in developing regional nuclear capabilities;

- North Korea's development of nuclear weapons continues unabated, fueling concerns over how the United States will ensure regional security; and

- Iran's determined pursuit of nuclear weapons may lead Middle Eastern countries—some of whom do not even get along with one another—to quietly solicit American protection.

In all of these circumstances, the extended deterrent provided by US nuclear weapons may assume greater prominence and importance. Yet, the US nuclear arsenal has shrunk to its lowest levels since the Eisenhower administration and is slated to be reduced even further, consistent with a policy whose stated objective is the complete elimination of nuclear weapons. It may be difficult to convince those who today see their own security guaranteed by the American nuclear umbrella and those who believe their future security depends upon tying themselves more tightly to the safety provided by US nuclear weapons that the shift toward other measures of assurance (e.g., advanced conventional capabilities, missile defenses, etc.) is not merely an attempt to justify policy decisions made in the absence of allied consultation and without sufficient understanding of the allies' perceptions of their own vulnerabilities.

As the number of strategic nuclear weapons and delivery platforms declines, burdens on the residual nuclear forces for implementing extended deterrence will rise. These burdens are unlikely to diminish, given the strategic realities noted above. A decline in its strategic nuclear forces may also impact the ability of the United States to forward deploy such forces to theaters of crisis. For example, although it may be seen as useful to forward deploy strategic bombers or submarines to the Pacific region as a signal of resolve, pressures to reduce these forces significantly—or even to abandon the traditional triad and move to a "dyad" or "monad"—

may mitigate against such deployments and diminish the credibility of extended deterrence in the eyes of allies, friends, and adversaries.

In Europe, the future disposition of remaining US nuclear forces will likely be addressed in an alliance-wide context. Though NATO publics are generally receptive to the goal of nuclear disarmament, their governments may be increasingly reluctant to abandon those remaining US nuclear weapons on European soil in light of the alliance's enlargement, growing concerns over Russian policy and behavior directed against its neighbors to the west, and the traditionally anemic defense investment of individual NATO countries that prefer the United States continue to assume the lion's share of the burden for their ultimate security. Having suffered the consequences of a failed conventional deterrence that led to two world wars on the continent, Europeans may not yet be ready to abandon the implements of deterrence that have successfully prevented a third for more than six decades.

Any changes to America's strategic nuclear posture should not occur in the absence of detailed, robust consultations with allies and friends. Such consultations will be easier to implement with European allies, as mechanisms have long existed to involve NATO governments in the nuclear planning process. The modalities for adapting this consultative process to Asian allies and friends is more complex, however, as they have not been integrated into US nuclear planning activities in the same way as NATO countries.

How Little Is Too Little?

Deterrence is an art, not a science. Therefore, it is not possible to declare with certainty that a particular level of nuclear weapons is sufficient to guarantee the effective functioning of deterrence—or extended deterrence—in all cases, at all times, against all possible adversaries. Indeed, what may be considered sufficient for deterrence today may prove insufficient tomorrow, as the strategic environment is highly dynamic.[64]

In the past, assurance considerations have factored into decisions regarding the overall size of the US strategic nuclear arsenal. This was certainly true with respect to the strategic force reductions postulated in the 2001 *NPR*. Consistent with its guidance, US strategic forces were reduced to their lowest levels in many decades. Despite these reductions, however, the range of 1,700–2,200 operationally deployed strategic nuclear weapons subsequently codified in the Moscow Treaty was chosen as "an

assurance-related requirement for US nuclear forces that they be judged second to none."[65]

To date, there has been no explanation of whether or how the reduced nuclear force levels of 1,550 warheads on 700 deployed delivery systems agreed to in the April 2010 New START accord have incorporated the assurance requirements of allies. The reductions required by New START, coupled with the Obama administration's declared intent to reduce US nuclear weapons even further on a path toward eventual elimination, may complicate the long-term viability of extended deterrence. One observer noted, "As numbers go down, extended deterrence concerns go up."[66]

Assuming continued reductions in US strategic nuclear forces, is there a threshold level beneath which the risks of aggression exceed the nation's ability to deter it? There can be no definitive answer to this question, as the answer will vary depending upon the specifics of the scenario postulated. However, the ultimate answer to this question depends primarily on the perceptions of allies and adversaries, not on American calculations and theories.

Likewise, it is difficult to ascertain the appropriate level of forward-deployed nonstrategic nuclear forces necessary to ensure the continued credibility of extended deterrence. For Europe, NATO will need to address this in the context of shifting perceptions of threats, alliance membership changes, and unique national circumstances.[67] In some cases, allies may feel extending a purely defensive umbrella (e.g., through deployment of active missile defenses on their territory), hosting the deployment of US troops, or other measures may provide sufficient deterrence against aggression from hostile neighbors or powers. Yet, this is an untestable proposition. Deterrence may succeed, but it is not possible to know with absolute certainty what accounted for its success. On the other hand, if it fails we will know with certainty that the measures we relied upon were insufficient.

Preserving the credibility of US security guarantees will always be challenging. Some of the difficulties were noted by two Lithuanian analysts who argued that

> security guarantees from third nations always suffer from credibility problem [*sic*]. History provides many examples when extended deterrence fails (e.g., British and French security guarantees did not deter Germany from attacking Poland in 1939). Extended *nuclear* deterrence is even more difficult to implement. For the United States, the United Kingdom or France to prove to other nations that they are ready to risk nuclear holocaust for the sake of the Baltic states is extremely difficult.[68]

Indeed, on whose behalf the United States should risk "nuclear holocaust" is a matter of considerable dispute. Some argue it should not extend its nuclear umbrella to countries that do not share its fundamental values. Others believe American nuclear security guarantees should only be extended to countries whose security is considered absolutely vital to US survival.

If, how, and to whom the United States should extend additional nuclear guarantees should be carefully considered. As the nuclear umbrella shrinks and the number of countries seeking protection under it grows, the implications for credible extended deterrence loom large. The benefits for deterrence must be balanced against the potential risks to the United States should it fail. This is not an easy task, and there are no simple answers. But decisions on whether to extend US nuclear deterrence to other states should be decided on a case-by-case basis, taking a range of country-specific and alliance-specific military, political, diplomatic, and other variables into account.

Despite these challenges, it is clear from the statements of some allies that reliance on the US extended deterrent is more important than ever, especially in light of changes in the strategic environment they perceive as directly threatening their security. It is also evident additional reductions to US nuclear forces may have negative consequences for the ability to assure allies that the United States is unwavering in its commitment to their security.

Conclusions

Extended nuclear deterrence has a long and relatively successful history. But most of that history was written during the Cold War under strategic circumstances that have been fundamentally altered. The demise of the Soviet Union, the rise of other nuclear-armed states, the proliferation of nuclear threats, the restructuring of alliances, and continued downward pressures on nuclear weapons and force levels suggest that extended deterrence, to be effective, must operate in new and challenging conditions.

Despite this new strategic environment, extended deterrence remains an important element of US security strategy. Its continued relevance has been recognized by the Obama administration through the statements of senior spokespersons like the secretary of state, secretary of defense, and the president himself. It has also been reaffirmed in the 2010 *NPR*.

Yet, the credibility of the US nuclear umbrella may be strained as a result of the desire to rid the world of those weapons upon which it is based. Simultaneously, the number of states seeking or obtaining the protection offered by the extended deterrent may increase as the size of nuclear forces providing that extended deterrent diminishes.

Determinations of the appropriate size and composition of the US nuclear arsenal must necessarily reflect the varied requirements of extended deterrence and assurance. Given the emergence of new threats, different regional security environments, and continuing challenges to reliance on nuclear weapons for deterrence purposes, it is not possible to posit with certainty a static level of nuclear forces that can simultaneously accomplish all necessary missions. However, it does appear plausible US nuclear force reductions will complicate achieving these missions. For this reason, future decisions regarding the size and composition of US nuclear forces should be informed by comprehensive consultations with friends and allies whose security depends on the viability of the US nuclear deterrent. Integrating allies into the formal consultative process on these issues may also have the attendant benefit of providing a form of reassurance. Absent such consultations, US policies intended to strengthen deterrence may actually hasten its failure. The consequences of such could be unprecedented and catastrophic for all. **SSQ**

Notes

1. For a more detailed examination of options for providing assurance, see "Nuclear Guarantees, Extended Deterrence, and the Assurance of Allies," in *Planning the Future U.S. Nuclear Force*, Vol. 2, *Foundation Report* (Washington: National Institute for Public Policy, October 2009), 55–58.

2. Indeed, during the Cold War some postulated that strengthening deterrence of the Soviet Union by deploying additional nuclear forces in Europe might weaken assurance (or reassurance) of European allies, who saw nuclear war as a greater threat than Soviet expansionism. See Michael Howard, "Reassurance and Deterrence: Western Defense in the 1980s," *Foreign Affairs* 61, no. 2 (Winter 1982): 309–24.

3. This notion of "existential deterrence" was popularized by McGeorge Bundy in the 1980s and reflected a belief that the destructive power of nuclear weapons made them militarily useless and the possession of merely a handful would be a sufficient deterrent to any potential aggressor.

4. Remarks by Pres. Barack Obama, 5 April 2009, Hradcany Square, Prague, Czech Republic.

5. See Josiane Gabel, "The Role of U.S. Nuclear Weapons after September 11," *Washington Quarterly* 28, no. 1 (Winter 2004/05): 193.

6. Ibid., 193–94. See also Kurt M. Campbell, Robert J. Einhorn, and Mitchell B. Reiss, eds., *The Nuclear Tipping Point: Why States Reconsider Their Nuclear* Choices (Washington: Brookings Institution, 2004).

7. US Department of State International Security Advisory Board, *Report on Discouraging a Cascade of Nuclear Weapons States*, 19 October 2007, 23.

8. Ibid., 15.

9. Secretary of Defense Robert M. Gates, "Nuclear Weapons and Deterrence in the 21st Century," speech before Carnegie Endowment for International Peace, 28 October 2008.

10. William J. Perry, James R. Schlesinger, et al., *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington: US Institute of Peace Press, 2009), xvii.

11. *Active Engagement, Modern Defence: Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organization*, adopted by the Heads of State and Government participating in the meeting of the North Atlantic Council in Lisbon, Portugal, November 2010, http://www.nato.int/lisbon2010/strategic-concept-2010-eng.pdf.

12. For an excellent discussion of assurance and extended deterrence, see David Yost, "Assurance and U.S. Extended Deterrence in NATO," *International Affairs* 85, no. 4 (2009): 755–80.

13. Klaus Naumann, John Shalikashvili, et al., *Towards a Grand Strategy for an Uncertain World: Renewing Transatlantic Partnership* (Lunteren, the Netherlands: Noaber Foundation, 2007), 94.

14. Cited in James L. Schoff, "Does the Nonproliferation Tail Wag the Deterrence Dog?" PacNet no. 9, Center for Strategic and International Studies (CSIS), 5 February 2009, http://csis.org/publication/pacnet-9-february-5-2009-does-nonproliferation-tail-wag-deterrence-dog.

15. Ibid.

16. Keith Payne, "On Nuclear Deterrence and Assurance," *Strategic Studies Quarterly* 3, no. 1 (Spring 2009): 54–55.

17. "Joint Vision for the Alliance of the United States of America and the Republic of Korea," Office of the Press Secretary, The White House, 16 June 2009.

18. Speech by Secretary of Defense Robert M. Gates, 21 October 2009, Yongsan Garrison, Seoul, Republic of Korea.

19. See Russian prime minister Vladimir Putin's statement in "Russia 'Must Counter U.S. Defenses,'" *BBC News*, 29 December 2009, http://news.bbc.co.uk/2/hi/europe/8433352.stm.

20. See Valentina Pop, "Ukraine Drops NATO Membership Bid," *EU Observer*, 4 June 2010, http://euobserver.com/13/30212.

21. This assurance is often referred to as the "three no's" and reflects NATO's earlier commitment to Russia that it has "no intention, no plan, and no reason to deploy nuclear weapons on the territory of new members." See the Founding Act on Mutual Reductions, Cooperation and Security Between NATO and the Russian Federation, Paris, France, 27 May 1997.

22. "North Korea's Nuclear Threat: Reinforcing Alliance with U.S. Helps Bolster Nuclear Deterrence," cited in "Nuclear Guarantees, Extended Deterrence, and the Assurance of Allies," in *Planning the Future U.S. Nuclear Force*, Vol. 2, 48.

23. Yukio Satoh, "Are the Requirements for Extended Deterrence Changing?" panel discussion at Carnegie Endowment International Nonproliferation Conference, 6 April 2009.

24. Hideo Tomikawa, "Briefing Memorandum Regarding the National Defense Program Guidance and the Mid-Term Defense Program," *National Institute for Defense Studies News* 152 (March 2011): 6, http://www.nids.go.jp/english/publication/briefing/pdf/2011/152.pdf.

25. Joint Statement of the U.S.-Japan Security Consultative Committee, 1 May 2007, http://tokyo.usembassy.gov/e/p/tp-20070502-77.html.

26. Satoh, "Are the Requirements for Extended Deterrence Changing?"

27. Ibid.

28. Joseph F. Pilat, "Nonproliferation, Arms Control and Disarmament, and Extended Deterrence in the New Security Environment," *Strategic Insights* 8, no. 4 (September 2009).

29. Vaidotas Urbelis and Kestutis Paulauskas, "NATO's Deterrence Policy—Time for Change?" *Baltic Security and Defense Review* 10 (2008): 87.

30. James R. Schlesinger et al., *Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management*, Phase II: *Review of the DoD Nuclear Mission* (Washington: DoD, December 2008), 14–15, 59–60.

31. Perry, Schlesinger, et al., *America's Strategic Posture*, 13.

32. Ibid., 20.

33. See Alexandra Bell, "Turkey's Nuclear Crossroads," *Good News*, 25 August 2009, http://www.good.is/post/turkeys-nuclear-crossroads. This account is also referenced in Miles A. Pomper, William Potter, and Nikolai Sokov, *Reducing and Regulating Tactical (Nonstrategic) Nuclear Weapons in Europe* (Monterey, CA: Monterey Institute of International Studies, December 2009), 22. In addition, a February 2008 report to the Senate Foreign Relations Committee cited a meeting with Turkish politicians who argued that without strong US commitments to Turkey's security, the development by Iran of a nuclear weapons capability would make it "compulsory" for Turkey to follow suit. See *Chain Reaction: Avoiding a Nuclear Arms Race in the Middle East, Report to the Committee on Foreign Relations* (Washington: US Senate, February 2008), 41.

34. Perry, Schlesinger, et al., *America's Strategic Posture*, 26.

35. See "Nuclear Guarantees, Extended Deterrence, and the Assurance of Allies," 55.

36. Perry, Schlesinger, et al., *America's Strategic Posture*, 20–21.

37. James M. Acton, "Extended Deterrence and Communicating Resolve," *Strategic Insights* 8, no. 5 (December 2009).

38. Hans M. Kristensen, "Japan, TLAM-N, and Extended Deterrence," *Federation of Atomic Scientists Strategic Security Blog*, 2 July 2009, http://www.fas.org/blog/ssp/2009/07/tlam.php.

39. Reported in Jeffrey Lewis, "Japan Hates TLAM-N," *Arms Control Wonk*, 25 January 2010, http://www.armscontrolwonk.com/2601/japan-hates-tlam-n.

40. Office of Secretary of Defense (OSD), *Nuclear Posture Review Report* (Washington: DoD, April 2010), 28.

41. Ibid.

42. Ibid., 27.

43. Ibid., 32.

44. For example, as Jeffrey Lewis has argued: "Would you do something dumb just because the Japanese asked you to? Of course not. That some Japanese officials irrationally focus on irrelevant capabilities to measure our commitment to Japan is a symptom of a much bigger problem that needs to be addressed with more than hardware." See "Japan ♥ TLAM-N," *Arms Control Wonk*, 8 May 2009, http://www.armscontrolwonk.com/2284/japan-tlamn.

45. A discussion of this point can be found in "Nuclear Guarantees, Extended Deterrence, and the Assurance of Allies," in *Planning the Future U.S. Nuclear Force*, Vol. 2, 64.

46. *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review*, Cm7948 (London, Her Majesty's Stationery Office [HMSO], October 2010).

47. *The Future of the United Kingdom's Nuclear Deterrent*, Cm6994 (London: HMSO, December 2006).

48. Ibid., 38–39.

49. *Securing Britain in an Age of Uncertainty*, 37.

50. Speech by Jacques Chirac, president of the French Republic, to the Strategic Air and Maritime Forces at Landivisiau/L'Ile Longue, 19 January 2006.

51. For example, former defense minister of the Federal Republic of Germany Manfred Wörner stated in 1985, "France's nuclear capability is insufficient to protect the Federal Republic. We will have to continue to rely on the American nuclear umbrella." Cited in Yost, "Assurance and U.S. Extended Deterrence in NATO," 761.

52. See Mark Schneider, "The Future of the U.S. Nuclear Deterrent," *Comparative Strategy* 27 (2008): 345–60.

53. Austin Long, *Deterrence from Cold War to Long War: Lessons from Six Decades of RAND Research* (Santa Monica, CA: RAND, 2008), 63.

54. Pilat, "Nonproliferation, Arms Control and Disarmament."

55. Testimony of Gen Kevin Chilton, commander, US Strategic Command, before the Strategic Forces Subcommittee of the House Armed Services Committee, 16 March 2010.

56. Joseph C. Martz and Jonathan S. Ventura, "Nuclear Deterrence in the 21st Century: The Role of Science and Engineering," a paper produced by the principal associate director for nuclear weapons, Los Alamos National Laboratory, LA-UR-08-05019, 2008.

57. Clark A. Murdock et al., *Exploring the Nuclear Posture Implications of Extended Deterrence and Assurance: Workshop Proceedings and Key Takeaways, Defense and National Security Group* (Washington: CSIS, November 2009), 2.

58. For a discussion of this point, see Yost, "Assurance and U.S. Extended Deterrence in NATO," 755–80.

59. OSD, *Nuclear Posture Review Report*, 28.

60. Ibid., 24.

61. Aluf Benn, "Obama's Atomic Umbrella: U.S. Nuclear Strike if Iran Nukes Israel," *Haaretz*, 12 November 2008.

62. For an interesting perspective on this statement and an analysis of US efforts to extend deterrence to Middle East states, see James A. Russell, "Extended Deterrence, Security Guarantees, and Nuclear Weapons: U.S. Strategic and Policy Conundrums in the Gulf," *Strategic Insights* 8, no. 5, (December 2009), http://www.nps.edu/Academics/centers/ccc/publications/Online Journal/2009/Dec/russellDec09.pdf.

63. Indeed, Saudi Prince Turki al-Faisal told a security conference last year that the kingdom might pursue its own nuclear weapons in that event. See Associated Press, "Prince Hints Saudi Arabia May Join Nuclear Arms Race," *New York Times*, 6 December 2011, http://www.nytimes.com/2011/12/07/world/middleeast/saudi-arabia-may-seek-nuclear-weapons-prince-says.html.

64. Unlike previous arms control treaties that established precise numerical ceilings on nuclear force levels, the 2002 Moscow Treaty allowed both the United States and Russia to maintain a range of between 1,700 and 2,200 operationally deployed strategic nuclear weapons. This flexibility was arguably more appropriate and relevant to the variable and evolving requirements of deterrence, including extended deterrence.

65. "Responses by Secretary of Defense Donald H. Rumsfeld and Gen Richard B. Myers to questions submitted for the record by the Senate Foreign Relations Committee on Treaty on Strategic Offensive Reduction: The Moscow Treaty," S. Hrg. 107-622, 107th Cong., 2nd sess. (Washington: GPO, 2002), http://www.gpo.gov/fdsys/pkg/CHRG-107shrg622/pdf/CHRG-107shrg622.pdf.

66. Chris Jones, "The Shades of Extended Deterrence," *CSIS*, 4 January 2010, http://csis.org/blog/shades-extended-deterrence.

67. As one analyst noted, "Because NATO has not identified targets for its nuclear forces since the 1990s, it is a challenge to specify and analyze the 1999 Strategic Concept's requirement for 'adequate nuclear forces in Europe.' . . . The minimum level may derive more from judgments about an appropriate level of risk- and responsibility-sharing among allies, and about what is necessary to demonstrate continuing U.S. engagement and commitment, than from a quantitative analysis of potential contingencies." Yost, "Assurance and U.S. Extended Deterrence in NATO," 758.

68. Urbelis and Paulauskas, "NATO's Deterrence Policy," 99.

The Common Sense of Small Nuclear Arsenals

James Wood Forsyth Jr.

Common sense is not what we put into the world. It is what we find there.

—Jacob Bronowski

With the publication of President Obama's security strategy, entitled *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, it appears US policymakers are interested in reducing the size of America's nuclear arsenal.[1] This seems to make sense. Reducing the number of nuclear weapons in the world has been part of the American security agenda for some time. Interestingly, as the United States seeks yet another round of nuclear arms reductions, the number of states with small nuclear arsenals has risen, albeit slowly, throughout the world. As of 2010, nine states possessed nuclear weapons. The United States and Russia each has thousands, with estimates running as high as 20,000 between them. The remaining seven states share a combined total of approximately 1,000.[2] In this regard, the United States and Russia appear to be out of line with the rest of the world; small nuclear arsenals, not large ones, are the global norm. As the United States contemplates a change in its nuclear posture, might a new epoch in the evolution of nuclear history and strategy be emerging? Has the age of small nuclear arsenals truly arrived?[3]

Small nuclear arsenals are not new, per se. For a variety of reasons, France developed a small, independent nuclear arsenal after World War II.[4] It kept its force levels comparatively low, even during the Cold War when the arms buildup in the Soviet Union would have seemed to threaten its very existence. France's behavior is not unusual, however. The majority of states with nuclear arsenals have opted to keep them relatively small; they have not acquired large numbers of nuclear weapons, as was the habit of the superpowers during the Cold War. Instead, these states seem content

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with a small force capable of warding off an attack as well as dissuading others from interfering in their internal and external affairs. That pattern is continuing and, therefore, is worth examining.

In this article I use structural theory to explain what I call "the common sense of small nuclear arsenals." The central claim advanced here is that small numbers of nuclear weapons seem to socialize leaders to the dangers of adventurism and, in effect, halt them from behaving recklessly or responding recklessly to provocation.[5] This is a bold and somewhat dangerous claim, so it is important to elaborate the argument. Like many, I believe nuclear weapons are here to stay for the foreseeable future, however regrettable that might be, and I make no claims about the durability of deterrence. Deterrence may indeed fail one day, but if it does, it will not be because leaders are insensitive to the punishments they face should they choose to use a nuclear weapon. If leaders were insensitive to punishment, deterrence would not work at all. Furthermore, mine is a state-centric argument. Why? States remain, for better or worse, the most important actors in international politics. That is not to say they are the only actors. Clearly, they are not. But should the day come when a nonstate actor obtains a nuclear weapon, it will, in all likelihood, be provided by someone connected to a state.

I begin the argument by examining the dynamics of deterrence and dissuasion and then explain small nuclear arsenals in terms of structural theory, relying most heavily on the effects of socialization. Lastly, I outline some concerns for policymakers.

The Dynamics of Deterrence and Dissuasion

Nuclear weapons, more so than any other, "hold power at bay," as Bernard Brodie so aptly put it.[6] In what remains one of the most quoted statements in the field of national security studies, Brodie summarized the message of his book *The Absolute Weapon* with these words: "Thus far, the chief purpose of our military establishment has been to win wars. From now on, its chief purpose must be to avert them. It can have no other useful purpose."[7] As a RAND analyst, Brodie would develop a deep understanding of nuclear weapons and their destructive potentialities. For illustrative purposes, this cannot be overstated: one 300-kiloton weapon is more than enough to destroy a city the size of London. If a bomb of that size were detonated above Trafalgar Square on a workday,

approximately 240,000 people would die instantly, and 410,000 casualties would be sustained. Nearly everything within a 3-km radius would be destroyed, with burn victims reaching out as far as Victoria Park. The same bomb detonated above Mumbai on a workday would kill over one million people and produce more than two million casualties.[8] Even if one were to assume the worst, a "bolt from the blue" in which a state lost 50 percent of its nuclear capability to a first strike, a relatively small force of even 100 weapons would allow that state to strike back over 50 times before it had to negotiate.[9] Common sense would tell us that few states, if any, could withstand that sort of punishment, and even fewer leaders would run that sort of risk. Nonetheless, as deterrence strategy evolved, discussions often focused on the idea that it was difficult to achieve.[10]

In the Eisenhower years, "massive retaliation" was the phrase used to describe how America would respond to a Soviet attack. Certainly, deterrence must have been presumed to be difficult if one had to threaten to respond massively to achieve it. As the Soviet arsenal grew, MAD (mutually assured destruction) became the acronym for the notion that deterrence depended upon the capability and the will to destroy a country. Beginning in the 1960s, assured destruction became the emphasis, and the policy became something of a two-headed monster. Not only was deterrence difficult to achieve, but the thought it might fail made the very attempt to achieve it doubly dangerous. Henry Kissinger made this plain when he counseled European allies not to keep "asking us to multiply strategic assurances that we cannot possibly mean or if we do mean, we should not want to execute, because if we execute, we risk the destruction of civilization."[11]

Throughout the Cold War the idea that deterrence was difficult cast a long shadow. But as the Cold War evolved, so, too, did analysts' thinking.[12] When the Eisenhower administration introduced its New Look policy in January of 1954, John Foster Dulles left the world with the impression that aggression anywhere would elicit heavy nuclear retaliation. Just three months later, he amended that policy. To deter major aggression, Dulles thought, "the probable hurt" only needs to "outbalance the probable gain."[13] In the 1960s, the Kennedy administration recognized both the need for a secure retaliatory capability and the fact that the services desired to purchase capabilities far in excess of that need.[14] It therefore sought to program capabilities that would be invulnerable to a counterforce strike and would be able to inflict unacceptable damage on the Soviet

Union—but no more.[15] Looking back, Secretary of Defense McNamara had this to say:

> Our goal was to ensure that [the Soviets], with their theoretical capacity to reach such a first-strike capability, would not outdistance us. But they could not read our intentions with any greater accuracy than we could read theirs. The result has been that we have both built up our forces to a point that far exceeds a credible second-strike capability against the forces we each started with. In doing so neither of us has reached a first-strike capability.[16]

In other words, both sides were deterred fairly early on, even though that may not have been the intention.

Similarly, reflecting on what he learned from the Cuban missile crisis, Kissinger remarked that the Soviet Union had only "60–70 truly strategic warheads while we had something like 2,000 in missiles and bombs. . . . [But] with some proportion of Soviet delivery vehicles surviving, the Soviet Union could do horrendous damage to the United States."[17] Since there was no way to ensure our force of 2,000 could destroy their smaller force of 60 or 70, the crisis exemplified how a small force could inhibit the use of a large one. Along these lines, National Security Advisor McGeorge Bundy concluded, "A decision that would bring even one hydrogen bomb on one city of one's own country would be recognized in advance as a catastrophic blunder; ten bombs on ten cities would be a disaster beyond history; and a hundred bombs on a hundred cities are [*sic*] unthinkable."[18]

Whatever its logical shortcomings, it is important to stress that deterrence worked—it kept the Cold War "cold" and allowed international life to go on without a catastrophic nuclear war. After 70 years, most analysts agree on the basic dynamics of deterrence, and the contemporary debate regarding deterrence, when not addressing the problem of nonstate actors, tends to pivot on force structure considerations.[19] Here, the behavior of states with small nuclear arsenals is instructive. As previously mentioned, most states with nuclear arsenals have not acquired large numbers of nuclear weapons. Instead, they appear content with a relatively small arsenal capable of warding off an attack as well as dissuading others from interfering in their internal and external affairs. But of the two roles nuclear weapons seem to play—deterrence and dissuasion—is one more important than another? For India and Pakistan, nuclear weapons play a decidedly deterrent role. But if one were to free Britain of its NATO obligations, who exactly would Britain be deterring today? What about France? Neither of these countries is as hard-pressed in the security arena as India or Pakistan,

yet both hold on to nuclear weapons. While nuclear weapons still "hold power at bay," one must wonder whose power is being held at bay and how.

It is important not to overinterpret this. Nuclear weapons serve a purpose. How else can one explain why nine states have them, while others appear to want them? But what purpose do they serve, in general? To answer that question, one must look at what nuclear weapons do for states. Among other things, nuclear weapons socialize leaders to the dangers of adventurism and, in effect, halt them from behaving or responding recklessly to provocation.[20] Statesmen may not want to be part of an international system that constrains them, but that is the system that results among nuclear powers. Each is socialized to the capabilities of the other, and the relationship that emerges is one tempered by caution despite the composition, goals, or desires of its leaders. In short, nuclear weapons deter *and* dissuade.

Dissuasion is not a new term, but it is one that lacks specificity. The use of the term here stems from the work of Patrick Morgan, whose thoughts on general deterrence are particularly useful. Dissuasion and general deterrence share many common elements. Both are rooted in deterrence theory and share an emphasis on uncertainty and ambiguity. Like general deterrence, dissuasion is "complicated and ambiguous, hard to analyze." Because it is amorphous, theorizing about general deterrence has been difficult. The same can be said for dissuasion.[21] But deterrence and dissuasion are not two sides of the same coin; they differ in a number of important respects.

Deterrence involves "setting the stage—by announcement, by rigging the tripwire, by incurring the obligation—and waiting. The stage-setting can be non-intrusive, non-hostile, and non-provocative, but the act to be deterred is always intrusive, hostile, and provocative. The deterrent threat changes the consequences only if the act in question—the one being deterred—is then taken."[22] Dissuasion need not be announced; there are no tripwires or obligations, no waiting or threats. Dissuasion does not change the consequences of a specific act in question but does, through socialization, change the nature of state relations. Deterrence is specific; dissuasion is more general. For deterrence to work, one "must dig in or lay a mine field."[23] For dissuasion to take hold, one need only possess mines, albeit nuclear ones. In this regard, the pursuit of power to deter *and* dissuade marks a difference in relations among nuclear powers today. The relationship among China, Russia, and the United States is instructive.

China's nuclear numbers remain puny compared with those of Russia and the United States. Yet, despite these large nuclear inequities, China continues to modernize its conventional and nuclear capabilities, extending its influence throughout the region. How does one explain this behavior? Apparently, China has reasoned that its small nuclear arsenal is sufficient to socialize rivals to the dangers of war. There is little that Russia or the United States can do militarily to prevent China from pursuing its armament programs or vice versa. The presence of even a small number of nuclear weapons makes talk of war reckless, so leaders on all sides try to avoid it. Yet, it would be a mistake to suggest that China is actively deterring the United States or Russia in the same manner that the superpowers deterred one another during the Cold War. Instead, it might be more precise to conclude that the three countries have tacitly entered into a period of mutual dissuasion; nothing official has been declared, but all know the stakes are too high for anyone to engage the other militarily. If leaders in China, Russia, and the United States understand this, others do as well, which is why the slow spread of small nuclear arsenals (i.e., nuclear proliferation) is likely to continue.

Why Numbers Don't Count

Strategists have long recognized that throwing more men and weapons into battle may increase the carnage but not necessarily procure victory. The same holds true with nuclear numbers. Simply put, large arsenals buy statesmen little. This presupposes that statesmen are not sensitive to the actual number of nuclear weapons a state may possess; they are sensitive to whether or not it has one at all. The mere fact that a state may have a nuclear weapon or seek to acquire one seems to be sufficient to condition statesmen to act cautiously. As Steven Walt aptly put it, American policymakers understand this logic, or "they would not be so worried when a state like North Korea or Iran makes a move to join the nuclear club."[24] This begs the question, How many nuclear weapons do states need to achieve relative security? That is a big question for which there is, theoretically, a small solution: an arsenal that an adversary might be able to take out with a first strike and one it knows it cannot. Since deterrence holds as a result of a viable second-strike capability, the capability to dissuade need not be large.[25]

But suppose an adversary were contemplating a first strike. What do you believe the second question put to the leader would be? It might be, And which city of ours are we willing to give up in exchange? The example is illustrative for two reasons. First, strategy is not contingent upon just the first move but also the following ones.[26] Second, in high-stakes games like nuclear war, second- or third-round moves are riddled with danger, so everything turns on preventing the first move, which makes the game relatively easy to understand and simpler to play. Moreover, leaders socialized to the dangers of nuclear weapons seem to understand that while numbers count, a small number of nuclear weapons are more than enough to dissuade the staunchest of rivals, even ones with comparably large nuclear numbers. Again, China's behavior is instructive.

As mentioned, China's nuclear numbers remain relatively small compared to those of the United States and Russia—approximately 400 nuclear weapons, with about 200 operationally deployed. China most likely possesses 30 intercontinental ballistic missiles (ICBM) capable of striking the continental United States and about 10 capable of striking Hawaii and Alaska. It also possesses roughly 100 intermediate-range weapons capable of striking US bases, friends, and allies in the Pacific region.[27] In contrast, the United States possesses approximately 450 ICBMs, each capable of carrying one to three warheads; 14 Trident submarines, each equipped with 24 submarine-launched ballistic missiles (SLBM) that carry as many as eight warheads each; and 100 or so nuclear bombers capable of carrying a variety of payloads to include air-launched cruise missiles (ALCM).[28] For illustrative purposes, let us assume Russia has a similar mix. As previously mentioned, despite these rather large nuclear inequities, China continues to modernize its conventional and nuclear capabilities, extending its influence throughout the region.

China behaves as if its small nuclear arsenal is sufficient to dissuade rivals. In international politics, dissuasion restrains states from acting externally but affords opportunities to act internally, allowing China to pursue whatever weapons it chooses. Shrewd states recognize this as well as the fact that large nuclear arsenals have a diminishing return. There seems to be little the United States or Russia can do militarily to prevent China from pursuing its armament program. This is not the same as saying that nothing can be done to influence China's policies. China's economic, diplomatic, and military policies can be influenced by the coordinated economic, diplomatic, and military policies of the United States and

Russia, but China's military designs are secured by its relatively small nuclear arsenal.[29]

Socialization, Nuclear Weapons, and Structural Theory

Since the advent of nuclear weapons, there have been few wars among nuclear states. That is not the same as saying nuclear powers do not quarrel, threaten, or even fight proxy wars against one another—they do. But nuclear states rarely, if ever, fight wars against one another. Why? As previously mentioned, nuclear weapons seem to socialize leaders to the dangers of adventurism and, in effect, halt them from behaving recklessly. In short, the risk of nuclear war makes leaders risk-averse; they must act with deliberate restraint, carefully plotting their courses of action in terms of how other nuclear leaders might react, even if they would prefer not to. Along with the "democratic peace" theory—which has been touted as the closest thing we have to an empirical law of international behavior—the "long peace" among nuclear powers is impressive.[30]

Some might have difficulty imagining why nuclear leaders would behave in the manner described here, so a brief discussion on the role of structure in international politics is warranted. Structural analysis addresses the positioning of actors in social and political systems—the properties and relations that make them parts of a system.[31] Within the field of international politics, most scholars accept Waltz's tripartite conception of structure (functional differentiation, ordering principles, and power distribution). In the standard Waltzian account, international systems are largely undifferentiated—and pretty much all the same. States are assumed to be "like units" made different only by their position among other states, strong states being privileged over weak ones. Anarchy is the "ordering principle" of international systems, meaning that there is no higher authority to which states can appeal to reconcile differences or ensure their survival. Power is distributed unevenly throughout the system, so states are unequal—making international systems unequal. To say structural theory provides a positional picture of politics is to say that states can be measured in terms of how they stack up against one another in terms of relative power. Few things affect this "stacking up" more than nuclear weapons, which is why statesmen pay attention to who has these weapons and if they might be used against them.

To say that nuclear weapons socialize leaders to the dangers of adventurism is to say that leaders pay attention to survival, because no one else can do so for them; the structure of international life prohibits it. In this sense, the "survival motive" is law-like. All human conduct is shaped in some measure by what individuals believe to be general laws. In science, laws establish relations between variables. Kepler's laws of planetary motion described the orbits of the planets by proving that a planet "sweeps out equal areas of its ellipse in each equal interval of time."[32] That is not how I use the term here, for in international politics there are no laws that operate with such fidelity. There are, however, softer, law-like relationships. "Such relationships are not based on a linkage that has been found, but on one that has been found repeatedly."[33] To assert that democracies do not fight wars against one another is to make a law-like statement. Moreover, states, like humans, respond to signals and interpret them by putting them into some general category thought to be law-like. As Jacob Bronowski noted, "We then assume that the future will have some general likeness with futures we have met before which followed this kind of signal, and this is the kind of future we prepare for."[34] Few things send a stronger signal to statesmen than the threat of nuclear war, and in this regard, the threat of nuclear war plays a socialization role. Since socialization is important to this discussion, we need to be clear about its meaning.[35]

Socialization refers to a relationship between at least two parties where "*A* influences *B*. *B*, affected by *A*'s influence, then influences *A*." As Waltz put it, "Each is not just influencing the other; both are being influenced by the situation their interactions create." Moreover, the behavior of the pair cannot be "apprehended by taking a unilateral view of either member."[36] Each acts and reacts in accordance with the other. The "global teenager" provides an example of the socialization process that occurs throughout the world. No one tells all the teenagers in the world to dress alike, but most of them do most of the time.

Likewise, no one tells all the states in the world to behave themselves, but most of them do most of the time. States are socialized to this idea by interacting with other states, particularly the great powers—whose role it is to set and enforce the rules of the game. In both instances, socialization is "a process of learning to conform one's behavior to societal expectations" and a "process of identity and interest formation."[37] Socialization draws members of a group into conformity with its norms. Socialization also encourages similarities in behavior. Analogically speaking, nuclear

which is to fire nuclear weapons—which is a hell of an alternative—and begin a nuclear exchange, with all this happening.[41]

During the entire crisis, the number of Soviet nuclear weapons on Cuban soil was never the focal point of US concern; in fact, the true number of these weapons—strategic and tactical—was not known until many decades later. The avoidance of nuclear war was the focal point; the threshold easily recognized, best not crossed, and worth avoiding. As early as 1962, the superpowers understood that they could race to the brink but no further, lest they run the risk of nuclear war; a risk that neither side would willingly take. Following the crisis, both sides took steps to reduce uncertainty and improve crisis stability.

As Kennedy and Khrushchev became increasingly socialized to the possibilities of nuclear war, the relationship that emerged was tempered by caution in that each leader sought solutions short of war. Something similar seems to have occurred during the Kargil conflict between India and Pakistan. Prior to acquiring a relatively small nuclear capability, Pakistan fought three bloody wars with India. Today, with both parties possessing nuclear forces, the sharp differences that separate India and Pakistan have not been sufficient to drive either side to war.[42] While the two sides actively engage in a game of tit-for-tat, nuclear weapons seem to have socialized leaders to the dangers of nuclear war, and as a result, the relationship between them has steadied. Far from perfect, relations between India and Pakistan can be summarized as tense but stable.[43]

The presence of nuclear weapons played a role in shaping the character of the Kargil conflict, the first conflict between nuclear-armed India and Pakistan. A retrospective look indicates that neither side actually threatened the other with the use of nuclear weapons.[44] This was not clear during the conflict, however. According to one source, nuclear threats were issued between Pakistan and India no fewer than 13 times.[45] The most prominent of these was made by Pakistan's foreign secretary Shamshad Ahmad when he stated, "We will not hesitate to use any weapon in our arsenal to defend our territorial integrity."[46] Additionally, it was believed that both sides increased their nuclear readiness levels.[47] US intelligence agencies believed Pakistan had mobilized and was arming its missiles with nuclear warheads—a fact that caused President Clinton to lean heavily on Prime Minister Sharif to withdraw Pakistani forces and bring the conflict to an end.[48] India, too, had reportedly placed its forces at "Readiness State 3"—

preparing aircraft as well as short- and medium-range ballistic missiles for use.[49]

Whether overt threats were exchanged or nuclear forces mobilized seems to have mattered less than the presence of nuclear weapons. That is, nuclear weapons seem to have played a role in how each side fought during the conflict. Of the two states, India was most notable for the restraint it put on its armed forces. Unlike in previous military responses to Pakistani aggression, Indian leadership took great care to avoid sending Indian forces into Pakistani territory.[50] According to P. R. Chari, Indian forces "were under strict orders not to cross the LoC [Line of Control] under any circumstances. Hot pursuit of retreating enemy forces was not permitted, nor could their bases across the LoC be attacked."[51] Additionally, though it may have been militarily prudent to divert Pakistani attention, India refrained from taking the fight outside of the immediate Kargil region.[52]

Although the cover of nuclear weapons may have played a role in convincing Pakistan it could get away with the initial incursion, when the miscalculation became apparent, Pakistan showed careful resolve to avoid further escalation. Like India, Pakistan may have benefitted from opening a second or multiple fronts, but even in the face of India's successful counteroffensive, Pakistan limited the fighting to the Kargil region.[53]

Nuclear weapons also ensured that diplomatic channels remained open between Pakistan and India throughout the conflict. Pakistani and Indian leadership met both officially and in secret in attempts to defuse the situation and prevent further escalation.[54] The presence of nuclear weapons almost certainly ensured the international community took a more active role in ending the conflict. The United States, in particular, went to great lengths to encourage both India and Pakistan to avoid escalation and end the conflict. As noted above, pressure from President Clinton may have been the final deciding factor in Sharif's decision to withdraw Pakistani troops.

From the perspective of socialization, the behavior of India and Pakistan cannot be resolved into a simple set of two-way interactions. To say each side was interacting, with the action of one eliciting a reaction from the other, obscures the socialization effects produced by their interactions. "Each acts and reacts to the other. Stimulus and response are part of the story. But also the two of them act together in the game, which—no less because they have devised it—motivates and shapes their behavior. Each is playing to each other and to the tensions their interactions produce."[55] Because socialization draws members of a group into conformity with its

norms, it reduces variety. Conformity to group norms and reducing variety are essential elements in creating and sustaining persistent relations within and among states. The persistent characteristics of group behavior result in part from the qualities of its members and in part from the characteristics of the relationship their interactions produce.[56] In this sense, nuclear relationships, as exemplified by the behavior of the United States, Russia, India, and Pakistan seem to be cautious ones. From this, one should not conclude that nuclear leaders behave with law-like regularity. But one can infer that nuclear leaders, even in times of crisis, tend to seek solutions short of all-out war, which is another way of saying the possibility of nuclear war makes them risk-averse.

Anticipating Three Objections

Critics will contend that the kind of restraint noted above rests on a presumed level of rationality not found in the real world. In fact, the opposite seems to be true. It is more difficult to find an example of the irrational actor in the real world than a rational one. What, exactly, is an irrational actor? Is it a state that violently disagrees with the policies of the United States? If that is the case, there are precious few. North Korea and Iran might fit this description, although neither is particularly violent, at least toward the United States. On the other hand, it could be some-one who fits the literal meaning of the word "irrational." An actor is said to be irrational if he or she demonstrates an inability to reason, but in international politics those actors are hard to find. Instead, what one finds are fairly reasonable actors who formulate decisions based on their interpretation of the world around them. Few things shape the "world around them" more than the presence of nuclear weapons, which is why nuclear leaders behave cautiously when staring into the face of another nuclear leader. It should be noted that policies based on that sort of reasoning are neither rational nor irrational, but merely reasonable.

With respect to numbers, there are those who insist the United States must maintain a nuclear arsenal large enough to cover all contingencies. In other words, while China has to contend with the United States and Russia, the United States has a greater number of potential contenders and needs a larger number of weapons to cover a larger number of options.[57] There is logic in that line of reasoning, but it tends to overemphasize the role of deterrence while overlooking the role of dissuasion. The United States

and Russia are already dissuaded by China, even if that were or were not China's original intention. Presumably, if China's relatively small nuclear force is capable of dissuading the United States and Russia, it is also capable of dissuading India and Pakistan. In other words, China's small nuclear arsenal creates enough options for it to dissuade three regional nuclear powers as well as the United States. Unless one assumes the United States must guard against something far more dangerous than what China faces, it is reasonable to conclude that a relatively small nuclear force is all the United States needs to meet its security requirements. Arguments for a large force seem to lose their meaning unless they are tied to a counter-force strategy which, when judging by the behaviors of nuclear leaders, is not necessary. As McNamara's earlier remarks attest, the superpowers increased their nuclear numbers to prevent one side from acquiring a numerical advantage over the other. All the while, leaders on both sides lost sight of the fact that nuclear weapons, while incapable of producing military effects, are extremely capable of producing political ones.

Yet some "large number" strategists will wonder about the remotest of possibilities: the United States awakens one day to discover that all the nuclear powers in the world—including some of its staunchest allies like England, France, and Israel—have united against it. What then? To ensure deterrence holds in such a world, the United States would presumably need at least one more nuclear weapon than all the nuclear powers on Earth combined.[58] But again, even in this most bizarre of worlds, the socializing effects of nuclear weapons would be felt by all, because challengers could never be sure who the United States would strike first, which is something its leaders would have to threaten to do to ward off attack.

Lastly, some will argue that the United States should maintain a large enough arsenal so it can extend security guarantees to others. There is an important case to be made for such guarantees. Yet, while nuclear guarantees might be our fate, one wonders if they should be our de facto policy. As the Kissinger quote cited earlier suggests, guarantees can put guarantors in a tough spot. Perhaps the most important consideration when thinking about guarantees is whether they will prevent a state from acquiring a capability of its own. France developed a nuclear capability of its own for a number of reasons, to include its history of strategic decline, serious questions about allies stemming from Dien Bien Phu and the Suez crisis, the expense of conventional rearmament, fears about its infantry becoming NATO cannon fodder, and the need to restore grandeur. If,

above all else, France were motivated by a sense of grandeur, there seems to be little guarantees could have done—how could a security guarantee help France recapture its grandeur? The point being, states seek nuclear weapons for a variety of reasons. Some will be satisfied with guarantees; others might not. Understanding the conditions and contexts for extending guarantees—to include to whom and when—seems essential.[59]

Conclusions

Structural theory helps explain what I call "the common sense of small nuclear arsenals." The central claim advanced here is that small numbers of nuclear weapons seem to socialize leaders to the dangers of adventurism and, in effect, halt them from behaving or responding recklessly to provocation. Policymakers should rightly be concerned with the implications of this argument.

A state does not have to demonstrate a capacity to win a nuclear war to prevent one, because the devastating consequences of nuclear war are transparent, well understood, and universally recognized. McGeorge Bundy's comment is worth repeating: "A decision that would bring even one hydrogen bomb on one city of one's own country would be recognized in advance as a catastrophic blunder; ten bombs on ten cities would be a disaster beyond history; and a hundred bombs on a hundred cities are [*sic*] unthinkable."[60] There is, however, a divide between war fighters—who must think about such things—and arms controllers who work to reduce the number of weapons in the world. Both find common ground on this: from the beginning, nuclear weapons and US policy have been devised to prevent the outbreak of a nuclear war, not to win one.

On that axis, things like readiness, survivability, and flexibility are vital ingredients, and a robust nuclear triad appears the most effective scheme to prevent the outbreak of nuclear war. That small states can achieve relative security without one is telling. One wonders how US policymakers will react if China were to build a triad of its own? Would it be interpreted as a means to enhance security, or would it appear threatening? With that in mind, the question for US policymakers seems to be what size nuclear force the United States needs to achieve relative security. It has been suggested that the United States could ensure its security with a relatively small force comprised of 311 nuclear weapons. That may not be the ideal number and, in fact, that number was suggested as a way to stimulate

debate on nuclear strategy, not to close any doors regarding force structure.[61] As evidenced by the president's interest in reducing the size of America's arsenal, however, it is no longer unreasonable to think that a small force might be as capable of deterring and dissuading as a large one.

In the end, structural theory claims that the international system constrains what states can and cannot do. Nuclear weapons add to this by socializing leaders to the dangers of nuclear war. Seven of the nine nuclear states recognize this and have concluded that a small number of nuclear weapons are sufficient to deter and dissuade rivals. Might the United States become number eight? That is for policymakers to decide. It would seem to make common sense, but common sense is not what we put into the world; it is what we find there. **SSQ**

Notes

1. The authors write, "It is possible that our deterrence goals can be achieved with a smaller nuclear force, which would reduce the number of nuclear weapons in our inventory as well as their role in U.S. national security strategy." *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington: DoD, January 2012), 5.

2. Exact numbers are hard to come by. According to one article, Russia has approximately 12,000, the United States 9,400, France 300, China 240, Britain 225, Israel 60–80, Pakistan 70–90, India 60–80, and North Korea fewer than 10. Robert S. Norris and Hans M. Kristensen, "Global Nuclear Inventories 1945–2010," *Bulletin of Atomic Scientists* 66, no. 77 (October 2010). Other estimates put the US number closer to 5,000, placing the total inventory between Russia and the United States closer to 17,000.

3. I wish to thank Edwina Campbell, Steve Chiabotti, Chuck Costanzo, Richard Muller, Alex Roland, Tim Schultz, and two anonymous reviewers for their thoughtful comments and suggestions. Additionally, thank you to Jeremy Olson whose work as a SAASS student was superb, as is his unpublished thesis entitled, "The Best Defense: Making Maximum Sense of Minimum Deterrence," upon which I relied for the Kargil discussion.

4. France was motivated by its history of strategic decline, serious concerns about allies, the expense of conventional rearmament, and fears about its infantry becoming NATO cannon fodder, but above all, the need to restore greatness and grandeur. See Jurgen Brauer and Herbert Van Tuyall, *Castles, Battles and Bombs* (Chicago: Chicago University Press, 2008), 244–87.

5. This theme reverberates throughout this discussion and originates with Kenneth Waltz, *Theory of International Politics* (New York: McGraw Hill, 1979).

6. Bernard Brodie, *Strategy in the Missile Age* (Princeton, NJ: Princeton University Press, 1959), 275.

7. Bernard Brodie, *The Absolute Weapon* (New York: Harcourt Brace, 1946), 76.

8. International Commission on Nuclear Nonproliferation and Disarmament (ICNND), *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers* (Canberra and Tokyo: ICNND, November 2009, December 2009), http://www.icnnd.org/reference/reports/ent/index.html. For the general argument, see Barbara G. Levi, Frank N. Von Hippel, and William Daugherty,

"Civilian Casualties from 'Limited' Nuclear Attacks on the Soviet Union," *International Security* 12, no. 3 (Winter 1987/88).

9. Included in this 50-percent loss are those weapons and their delivery systems that are not available or cannot reach their targets due to reliability and penetration issues. See Albert Wohlstetter, "The Delicate Balance of Terror," *Foreign Affairs* 37, no. 2 (April 1959).

10. For the workings of deterrence, see Brodie, *Absolute Weapon*; Lawrence Freedman, *The Evolution of Nuclear Strategy* (New York: Palgrave, 2003); William Fox, *The Superpowers: The United States, Britain and the Soviet Union* (New York: Harcourt and Brace, 1954); Alexander George and Richard Smoke, *Deterrence in American Foreign Policy: Theory and Practice* (New York: Columbia University Press, 1974); Morton Halperin, *Limited War in the Nuclear Age* (New York: John Wiley and Sons, 1963); Herman Kahn, *On Thermonuclear War* (Princeton, NJ: Princeton University Press, 1960); George Kennan, *Russia, the Atom and the West* (New York: Harper, 1958); Henry Kissinger, *Nuclear Weapons and Foreign Policy* (New York: Harper, 1957); Robert Osgood, *Limited War: the Challenge to American Strategy* (Chicago: Chicago University Press, 1957); Thomas Schelling, *The Strategy of Conflict* (Cambridge, MA: Harvard University Press, 1960); and Schelling, *Arms and Influence* (New Haven, CT: Yale University Press, 1966).

11. Henry Kissinger, quoted in Kenneth Waltz, "Nuclear Myths and Political Realties," *American Political Science Review* 84, no. 3 (September 1990).

12. See Emanuel Adler, "The Emergence of Cooperation: National Epistemic Communities and the International Evolution of Nuclear Arms Control," in *Knowledge, Power, and International Policy*, ed. Peter Haas (Columbia: University of South Carolina Press, 1997).

13. See Waltz, "Nuclear Myths and Political Realties," 733.

14. David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy 1945–1960," *International Security* 7, no. 4 (Spring 1983).

15. Alain Enthoven and K. Wayne Smith, *How Much is Enough: Shaping the Defense Program* (New York: Harper and Row, 1971).

16. *The Dynamics of Nuclear Strategy*, Department of State Bulletin LVII, 9 October 1967.

17. See Waltz, "Nuclear Myths and Political Realties," 734.

18. McGeorge Bundy, "To Cap the Volcano," *Foreign Affairs* 48, no. 1 (October 1969): 9–10.

19. See Fareed Zakaria, "GPS: What in the World? Nuclear Magic Number," *CNN*, 4 April 2010, http://transcripts.cnn.com/TRANSCRIPTS/1004/04/fzgps.01.html; David E. Hoffmann, "Despite New START, the U.S. and Russia Still Have Too Many Nuclear Weapons," *Washington Post*, 11 April 2010; Gary Schaub Jr. and James Forsyth Jr., "An Arsenal We Can All Live With," *New York Times*, 24 May 2010; Schaub and Forsyth, "Letters to the Editor: The Right Number of Nuclear Weapons?" *New York Times*, 31 May 2010, http://www.nytimes.com/2010/06/01/opinion/l01nuke.html; Max Berman, "Air Force Strategists Say US Should Unilaterally Cut Nukes By 90 Percent," *Wonk Room*, 17 March 2010, http://wonkroom.thinkprogress.org/2010/03/17/air-force-strategists-say-us-should-cut-nukes; and Charli Carpenter, "USAF Strategists: US Should Drastically and Unilaterally Reduce Nuclear Arsenal," *Lawyers, Guns and Money* blog, 18 March 2010.

20. Nuclear weapons also play a prestige or stature role, for example. See Suzanne Buono, "Demystifying Nuclear Proliferation: Why States Do What They Do" (PhD diss., Johns Hopkins, 2011).

21. Patrick M. Morgan, *Deterrence Now* (Cambridge, UK: Cambridge University Press, 2003). Also see David Yost, "Dissuasion and Allies," *Strategic Insights* 4, no. 2 (February 2005), for more recent usage of the term *dissuasion*.

22. Schelling, *Arms and Influence*, 71–72. For purposes of comparison, see Schelling's discussion on the differences between deterrence and compellence.

23. Ibid., 72.

24. Steven M. Walt, "All the Nukes You Can Use," *Foreign Policy,* 24 May 2010, http://walt .foreignpolicy.com/category/topic/military.

25. "Viable" assumes one possesses not only a survivable weapon but also a reliable means to deliver it.

26. I thank Everett Dolman for this.

27. William J. Perry and James A. Schlesinger, chairmen, *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington: US Institute for Peace, 2009), 10–11.

28. These numbers will be reduced by 2017 in compliance with the new Strategic Arms Reduction Treaty ("New START"). By that time, the United States is scheduled to have no more than 700 deployed strategic delivery vehicles (SDV).

29. If, as some suggest, China feels encircled by the American presence in the region, the United States must devise a strategy that will (1) recognize that China has legitimate interests in the region and find ways to accommodate China as it pursues them, (2) assure allies in the region that the growth of China's power does not threaten them, and (3) avoid actions that provoke the Chinese. Regarding all three, basing becomes a major concern. The recent deployment of 2,500 Marines to Australia might mark the beginning of a strategy designed to do all of the above.

30. The term *long peace* was introduced in John Lewis Gaddis, "The Long Peace: Elements of Stability in the Postwar International System," *International Security* 10 (Spring 1986): 92–142. On the law-like nature of the democratic peace, see Jack Levy, "The Causes of War: A Review of the Evidence," in *Behavior, Society and Nuclear War,* eds. Phillip E. Tetlock et al. (New York: Oxford University Press, 1989). For the philosophical argument, see Michael Doyle, "Kant, Liberal Legacies, and Foreign Affairs Parts I and II," *Philosophy and Public Affairs* 12 (1983): 205–35, 323–53. For a quantitative account, see Rudolph J. Rummel, "Libertarianism and International Violence," *Journal of Conflict Resolution* 27 (1983): 27–71. For an example of the structural account, see Clifton T. Morgan and Sally Campbell, "Domestic Structure, Decisional Constraints, and War: So Why Kant Democracies Fight?" *Journal of Conflict Resolution* 35 (1991): 187–221.

31. Jack Donnelly, "The Differentiation of International Societies: An Approach to Structural International Theory," *European Journal of International Relations* 18, no. 1 (2011): 151–76. As Donnelly suggests, Waltz's neorealism may have become pace, but structural theorizing has not. Also see Barry Buzan and Mathias Albert, "Differentiation: A Sociological Approach to International Relations Theory, *European Journal of International Relations* 16, no. 3 (September 2010): 315–37.

32. Jacob Bronowski, *The Common Sense of Science* (Cambridge: Harvard University Press, 1978), 27.

33. Waltz, *Theory of International Politics*, 1.

34. Bronowski, *Common Sense of Science*, 114.

35. A significant element of structural theory is the concept of socialization. For the definitive account of how socialization works on material concerns, see Waltz, *Theory of International Politics*, chap. 4 and 74–76. For the same regarding ideational ones, see Alexander Wendt, *Social Theory of International Politics* (Cambridge: Cambridge University Press, 1999).

36. Waltz, *Theory of International Politics*, 74–75.

37. Wendt, *Social Theory of International Politics*, 170.

38. Waltz, *Theory of International Politics*, 91.

39. Culture has become an important concern for the US military since 9/11. Often it is portrayed as a variable equal to or greater than force itself. Here, however, force seems to transcend cultural differences.

40. See Ernest R. May and Philip D. Zelikow, *The Kennedy Tapes: Inside the White House During the Cuban Missile Crisis* (Cambridge: Harvard University Press, 1997).

41. Ibid., 175–76.

42. The conflict began in May 1999 and ended in July of that year. During this time, Indian army units attacked Pakistani forces, and Indian jets bombed bases high in the Himalayan Mountains. Although Indian forces carefully stayed on their side of the line of control in Kashmir, Indian prime minister Atal Bihari Vajpayee informed the US government that he might have to order an invasion into Pakistan. Even though at least 1,000 Indian and Pakistani soldiers were killed during this crisis, I do not agree with those who think of Kargil as a war. Rather, my interpretation of Kargil is that the presence of nuclear weapons seems to have prevented a nasty skirmish from becoming all-out war. See Scott D. Sagen and Kenneth N. Waltz, *The Spread of Nuclear Weapons* (New York: W. W. Norton, 2003).

43. For an interesting perspective, see Sumat Ganguly, "Nuclear Stability in South Asia," *International Security* 33, no. 2 (Fall 2008): 45–70; and S. Paul Kapur, "Ten Years of Nuclear Instability in Nuclear South Asia," ibid., 71–94.

44. Timothy D. Hoyt, "Kargil: The Nuclear Dimension," in *Asymmetric Warfare in South Asia: The Causes and Consequences of the Kargil Conflict*, ed. Peter R. Lavoy (Cambridge: Cambridge University Press, 2009), 156.

45. Robert Wirsing, *Kashmir in the Shadow of War: Regional Rivalries in a Nuclear Age* (Armonk, NY: M. E. Sharpe, 2003), 49.

46. Ibid., 49.

47. Hoyt, "Kargil," 158.

48. P. R. Chari, "Reflections on the Kargil War," *Strategic Analysis* 33, no. 3 (2009): 363.

49. Hoyt, "Kargil," 158.

50. Ibid., 160.

51. Chari, "Reflections on the Kargil War," 362.

52. John H. Gill, "Military Operations in the Kargil Conflict," in *Asymmetric Warfare in South Asia*, 124.

53. Chari, "Reflections on the Kargil War," 363.

54. Peter R. Lavoy, "Why Kargil Did Not Produce General War: The Crisis Management Strategies of Pakistan, India, and the United States," in *Asymmetric Warfare in South Asia*, 194–96.

55. Waltz, *Theory of International Politics*, 75.

56. Ibid., 76.

57. I thank Stephen Wright for this.

58. In fact, numbers are only one part of the equation, although I believe them to be the most important part. Besides numbers, one must account for the size of the weapons, delivery systems, nature of targets, and defensive systems.

59. Guarantees may also increase moral hazard, emboldening states to take risks they would not ordinarily take if acting on their own. Additionally, they can be complicated by the dilemma of adverse selection; guarantors rarely know in advance if they have guaranteed a "worker or a shirker." That said, I do not think the United States should step away from its guarantees, but it is important to examine the value of such guarantees. Under what conditions are they most beneficial? For example, while it seems to make sense to afford a guarantee to Japan, is it reasonable to expect the United States to do the same for every potential NATO member? See Brauer and Tuyall, *Castles, Battles and Bombs*, 261–65.

60. McGeorge Bundy, "To Cap the Volcano," *Foreign Affairs* 48, no. 1 (October 1969): 9–10.

61. See James W. Forsyth Jr, Chance Saltzman, and Gary Schaub Jr., "Remembrance of Things Past: The Enduring Value of Nuclear Weapons," *Strategic Studies Quarterly* 4, no. 1 (Spring 2010): 74–89.

Forging an Indian Partnership

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In 2009 a new capability was introduced to the world as it rolled past a reviewing stand in China and onto newspaper and Internet opinion pages across the globe. Rumors over the capabilities and consequences of the Dongfeng 21D antiship ballistic missile raised questions over how the United States would respond to a country developing missiles with only one purpose—to deter or destroy US carriers at sea, far beyond their ability to strike back.

Many observers have noted with concern China's meteoric rise in both national GDP and expenditure on military equipment. Although the true amount spent on its military activity is shrouded in secrecy, the Chinese government's official figures have shown an average annual growth of 12.9 percent since 1989.[1] While the United States still spends more than China in both absolute terms and as a percentage of GDP ($698 billion vs. $119 billion and 4.8 percent vs. 2.1 percent, respectively),[2] these substantial growth trends, coupled with a lack of transparency over Chinese intentions, have caused alarm among some defense observers and neighboring countries. Despite China's open denial of any hegemonic aspirations and its attempt to assuage foreign concerns about the nature of its "peaceful development,"[3] many commentators have called for a strategy to not only engage with this proponent of a "harmonious society," but also to hedge or possibly balance its ambitions and capabilities. To these observers, India represents that potential counterweight and balancing force. Indeed, the latest US defense strategy released in January 2012 specifically mentions the long-term strategic partnership with India.[4]

Thanks to its surging economy, India is embarking on a robust military modernization program. It has purchased advanced equipment from numerous countries abroad while simultaneously trying to enlarge its domestic defense industry. India is currently the top importer of military

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weapons and equipment in the world,[5] spending approximately $41.3 billion, or 2.7 percent of GDP, in 2010,[6] and is expected to spend approximately $100 billion over the next decade on upgrades to its military fleet.[7] This hardware expansion has included C-17, P-8,[8] and Su-30MKI aircraft, T-90 tanks,[9] advanced communication systems, air and naval surveillance systems,[10] and warships, to include two Russian-built aircraft carriers by 2015.[11]

Positioned astride the center of the increasingly important Indian Ocean region, the world's largest democracy is experiencing its own revolutionary expansion. Following independence in 1947, India initially pursued a centrally planned economic system as a means to promote its industrial sector while balancing social justice concerns. These objectives and their accompanying protectionism led to decreased trade with foreign nations and heavy reliance on Soviet technical assistance, ultimately culminating in India's balance of payments crisis in 1990–91. In response, Prime Minister Narasimha Rao and the ruling Congress Party enacted a series of dramatic reforms to transform India's economy into a globally integrated market, achieving undeniable year-on-year successes.[12] This rapid growth is most recently exemplified by a 10.4-percent growth rate in 2010, even outstripping China's increase of 10.3 percent.[13] This growth shows an India that recognizes the threats and opportunities in its own future and under-stands that an economic giant can only become a great power if it plays an active role in international affairs and has a military that complements its economic strength.

Although India is challenged by its poor infrastructure and significant poverty, it has the advantage of a vast supply of young workers, and its growth is largely market driven as opposed to state managed, as in China. Analysts at Morgan Stanley predict India's growth rate (though not absolute size) will exceed China's within 3–5 years as well as continue to grow faster than any other large country through the next 25 years.[14] This economic optimism dulled in 2011 with the slowdown of India's economy; however, this phenomenon was not unique to India and may be part of a broader macroeconomic correction independent of specific Indian policies. Indeed, China itself is experiencing a similar slowdown. India's current challenges to curb high inflation, improve its substandard infrastructure, manage the declining value of the rupee (which conversely may have had the positive outcome of helping Indian exports grow by over 30 percent), and limit corruption may hamper the short- to medium-run potential of the Indian

economy if serious efforts are not made to confront these issues.[15] This is not to discount India's progress or potential but to encourage a more balanced appraisal of the challenges it will face economically and domestically as the United States seeks closer relations.

What will the future hold in an Asia characterized by China's seemingly endless growth and fears of waning American power? As the Obama administration refocuses its diplomatic and military efforts on its "pivot" toward Asia, the United States needs a revitalized strategy to adjust to the shifting global balance of power and to partner with nations to secure a peaceful and prosperous region. Can the United States rely on India to become a partner with its own promising growth and expansion, and what policies are necessary to promote this relationship?

Growing and Waning Power

As we look to the future Asian power dynamic, it is necessary to understand how power is measured if a regional balance of power is the ultimate objective. Although subject to intense debate, it is instructive to analyze a set of measurable conditions that may form a concept of power sufficient for this analysis. Notions of soft power[16] are difficult to project, but the most historically accurate methods of determining power among states involve economic strength, military might, and population size. In the absence of sizeable modern militaries, economic indicators are our best method of determining power, since economic strength can be translated into military power (evidenced by the billions of dollars spent by India and China to make such a conversion). Therefore, the use of projected economic growth rate and expected rates of expenditure on military equipment can project a reliable path of great-power growth in Asia. Population size also has historically indicated power potential, since a nation can muster human resources for industrial production or to bolster military forces. Here, India has an advantage over China, since its population is not hampered by the demographic challenges of a relatively smaller proportion of younger citizens (those of military age or economic viability) in the coming decades. *The Economist* asserts that in China, "The share of people over 60 will increase from 12.5 percent in 2010 to 20 percent in 2020 [and] by 2030 their number will double from today's 178m."[17] Obviously an analysis based on economic trajectory can be upset by dramatic slowdowns in a nation's domestic industry and growth,[18] but in preparing

for the future we must calculate our requirements based on perceived adverse scenarios, not optimistic wishes.

Using this understanding we can project China-US-India relative power relationships in the coming decades. The overall trend is a game of catch-up, where the Indian and Chinese economies (and therefore their absolute power) grow at a faster rate than the United States', although not at the same pace or from the same starting point. Despite predictions that India will grow faster than China for the next couple decades, Indian economic challenges place it far behind China on an absolute basis, as its economic reforms happened much later (1991) than the transformation of China under Deng Xiaoping in the late 1970s and '80s. Therefore, we can predict a time where China is approaching parity with the United States while India is still lagging behind but closing the gap. The date when the Chinese economy finally overtakes the United States' is a matter of dispute, but recent IMF figures point to 2016 as the critical year, using purchasing power parity (PPP) as opposed to absolute GDP size.[19] *The Economist* projects that this date will be 2018 using market exchange rates; so, although there is some room for disagreement, most analysts support this transition in the coming decade.[20]

Despite these projections, the specific point where the Chinese economy overtakes the US economy will largely be a symbolic moment. The United States will still retain the most powerful military force in the world and a dominant position in world affairs (as well as a much richer society measured in GDP per capita), but the overall picture is clear: the future of Asia will be characterized not by one hegemonic power exercising its will, but rather by a multitude of large states interacting in an environment of overlapping interests.

Indian Motivations for a US Partnership

Understanding the likely trajectory of power growth in Asia, why should India seek to partner with the United States to check Chinese ambitions? As the dominant world power, it is easy to see why the United States would seek to resist Chinese attempts to supplant its leadership, but does India have an incentive to promote a US-led order as opposed to one that is Chinese led? Both India and China have benefited tremendously from globalization and the current state of international affairs. The flow of goods and money across borders, supported by a state system anchored

on strong behavioral norms and an international security structure that promotes access to trade, has encouraged the growth and modernity of both societies. So, it is difficult to see how either country would jeopardize the very conditions that have led to its growth. It is likely a rising China would not seek to undermine this world order (in fact, many of its claims of sovereignty and noninterference are justified on the basis of this structure), but rather it would make changes on the margin to exert its influence and secure materials and territory to further its growth. However, even marginal changes could pose threats to Indian interests. This would likely involve competition for scarce resources and access to commercial shipping lanes or merely Chinese involvement with many of the neighbors with whom India has rocky relations or finds problematic.

This permeation of Chinese influence in the region has impacted numerous countries around India's periphery. Chinese ties with Pakistan amount to approximately $7 billion in yearly trade as well as significant military support, including civil nuclear power and nuclear weapons programs, assistance with short- and medium-range ballistic missiles, and jointly produced aircraft such as the JF-17 and K-8.[21] In Myanmar, China has maintained a close relationship with the military regime to ensure influence along Myanmar's long coastline. During the 1990s, both countries drew closer as a result of not only Chinese calculation but also mutual support over international backlash regarding each country's domestic repression. During this time, China supplied Myanmar with roughly $1.2 billion in arms and has continued to jointly develop and operate radar and surveillance systems that point far into the Bay of Bengal.[22] In Nepal, China has adopted an aggressive charm offensive through its investment in and construction of numerous roads, factories, power plants, and sports complexes as well as educational exchanges and increased trade between the two nations.[23] China's "string of pearls"[24] strategy also requires good relations with Sri Lanka. This has generated Chinese sales of tanks, APCs, and artillery as well as funding for a new seaport facility, airport, and roads, making China Sri Lanka's largest aid donor (gifting $1.2 billion) and largest investor.[25] Tucked under an elbow of Indian territory in the east, Bangladesh has also benefited enormously from Chinese support. In addition to typical investments and sales of military equipment, China also helped Bangladesh test-fire a Chinese-supplied C-802A antiship missile in the Bay of Bengal.[26]

This understanding also extends to other countries across the Asian continent. Although it is important to continue our support of these nations, no other country in Asia—with the exception of Russia and Japan (which is already a strong ally but with a limited military)—can fulfill the role of balancer. However, opportunities to co-opt Russia as a potential ally are slim, and Japan has serious troubles with its (albeit large) economy, demography, and limited domestic resources. It is also highly unlikely Japan would jettison its long-standing alliance with the United States to bandwagon with China due to their historical disagreements over World War II, the Senkaku/Diaoyu islands, and the recent fishing trawler collision. At the same time, India represents the best opportunity for developing a new US strategic relationship among the major powers. Given the likely power differential on the Asian continent, with India not large enough to balance China alone, the United States represents the best opportunity for India to resist Chinese hegemony.

Besides its potential to balance a rising China, India also occupies a strategic location along the increasingly important and crowded Indian Ocean. This region is home to vital oil and commercial shipping lanes as well as the strategic navigational bottlenecks of the Straits of Hormuz, Malacca, and Bab el Mandeb. With the Asian continent containing the two most populous nations in the world, each experiencing phenomenal growth in both GDP and demand for resources, these waters will form a centerpiece of global strategies in the coming decades. It is worth noting that 40 percent of seaborne crude oil pass through the Strait of Hormuz, and half the world's oil flow and a quarter of global trade pass through the Strait of Malacca. Furthermore, as China analyzes its own energy dependence on oil and natural gas, it cannot ignore that 85 percent of the oil it consumes passes through the Strait of Malacca. This gives China an even greater motive to ensure the region is secure while also pursuing various other routes for this precious energy.[27] Since economics and security are inextricably linked, these choke points represent potential obstacles and weaknesses for these emerging economies, as the demand for resources may one day outstrip the supply flow through these channels. India knows it is unable to secure these commercial trading routes and respond to various crises on its own. To meet this limitation, it has embarked on a strategy of working with regional partners to patrol these areas and develop working relationships to respond to potential flashpoints and crises. Since

the United States acts as the principal guarantor of world and regional security, India has a strong interest in partnering with US efforts.

The US-Indian relationship is characterized by more than just China and the security of energy resources. Numerous policy makers have identified a multitude of overlapping interests or areas where the United States is best positioned to advance those shared interests—preserving access to the global commons, countering terrorism and violent extremism, promoting international nonproliferation efforts, addressing human rights concerns, ensuring a stable and secure South Asia (including Afghanistan), and advancing the cause of democracy.[28] Rather than detail each of these interests in turn, this analysis addresses broader diplomatic and economic goals as well as specific defense policies to promote this relationship. Prior to detailing those recommendations, it is important to first look at challenges to developing this relationship and the perceptions of India's two principal strategic threats, China and Pakistan.

Indian Challenges

Encouraging increased cooperation between the United States and India is imperative for US security interests in the future. With the proper focus and effort, this relationship will pay handsome dividends to both countries; however, these greater ties raise additional questions and issues. For instance, how much can we expect from India in the short run toward developing this partnership, and will concrete political successes immediately derive from it? Stephen Cohen and Sunil Dasgupta argue that much of India's difficulty in improving its strategic position is due to its deliberate policy of "strategic restraint," and they defend their argument by examining the difficulties India has had due to a lack of civilian defense expertise, organizational problems, "weak planning, individual service-centered doctrines, and [a] disconnect between strategic objectives and the pursuit of new technology."[29] India's post-independence focus on autonomy suggests it will continue its strategic restraint, making it difficult for the United States to encourage greater Indian participation in thorny international issues. It is possible, however, the United States can use India's modernization and increasing capabilities to help relax its strategic restraint in the long run, although this will likely involve a gradual evolution in Indian thinking, not a radical departure from the past.

It is important to recognize that India is very hesitant to appear as party to an anti-China alliance or, for that matter, to become involved on either side of any foreign dispute; this neutrality has formed a central part of its foreign policy since independence. Throughout the Cold War, India was an essential member of the nonaligned movement, a collection of small states and former colonies dedicated to remaining neutral. Their policy of using force only as a last resort and staying removed from others' conflicts has arguably been very beneficial to India. It has been able to focus on generating domestic growth as opposed to promoting broad strategic objectives. Unfortunately, its neutrality has at times been indistinguishable from China's insistence on nonintervention in the internal affairs of other nations. Given India's propensity for isolationism, the challenge for the United States becomes how to gently coax it into the more participative foreign policy we desire.

India recognizes that China will play a crucial, if not dominant, role in Asian affairs in the decades to come. China is undoubtedly the economic powerhouse of the region, and India recognizes that the growth it cherishes will depend on successful trade flows and peace among its neighboring countries. The immediate benefits of maintaining amicable relations with China far outweigh the posturing of a balancing coalition. Any balancing behavior will be met in turn with hostility from China, disrupting the growth (and potential power) of all nations in the region. India, as well as most other countries around China's periphery, recognizes the potential issues posed by a strong and assertive China but seems satisfied for now to merely prosper together. Indeed, China is the largest trading partner for India, and both countries have committed to accelerating the flow of goods and capital from the current $60 billion annually to $100 billion by 2015.[30] The ASEAN states have a free trade agreement (FTA) with China and count it among their top trading partners,[31] so despite any uneasiness about Chinese intentions, it is unlikely that any ASEAN state would agree to join an explicit anti-Chinese alliance either. If India expects to grow faster than China in the long term, it could prefer to bide its time and wait for the engine of economic growth to ease it to prominence rather than embark on a pernicious containment strategy.

India's reluctance to join a formal alliance is a consequence not only of its perceptions of China and the outside world but also its internal political structure. Few places in the world can match the vast diversity of the modern state of India. With 17 languages and 22,000 dialects, the

country was mostly a collection of principalities and kingdoms for most of its long, rich history. Even today Indian politics is dominated by regional parties that win elections at the expense of national parties by running on platforms of narrow local concerns rather than broad national interests. This leads to government by coalition, where each party in the coalition can command significant political power and resources within its state but has little appeal to Indians elsewhere. This diversity therefore leads to the central authorities deferring to regional governments and makes it exceedingly difficult for the national government to "define a national interest, mobilize the country behind it, and then execute a set of policies to achieve its goals."[32] Due to the fractured and regional nature of Indian politics, there is not likely to be a bold new direction in India's national security strategy.[33] In fact, this factionalism hampers not only foreign policy but domestic efforts as well. It is significant that as India moves to address local or domestic problems, the ruling Congress Party routinely runs into difficulty generating meaningful laws, having failed to pass a significant bit of legislation since its election in 2009.[34] This domestic political environment may represent the biggest US challenge vis-à-vis India—that is, political paralysis could upset the Indian trajectory to open up, grow economically and militarily, and ultimately prosper as an Asian balancer.[35] The current government is also sensitive to criticism that India is beholden to US desires; therefore, it will be eager to place limits on US-Indian cooperation to assert its independence. This does not mean that relations will permanently stall due to domestic political concerns but that progress will be slow and require the steady patience of US policymakers. Since India's military represents one of its few national institutions, the United States can make important inroads toward cultivating a flexible partnership by strengthening ties between US and Indian military forces.

Although reluctant to join a balancing coalition against China, Indians sense that Chinese capabilities and internal weaknesses strongly argue for a distinct hedging posture, even if they outwardly deny the focus is their neighbor to the north. If China's growth stalls and its leadership is unable to placate its citizens with increased income and employment opportunities, the legitimacy of the regime may be threatened by the rumblings of a disaffected population. In the past the Chinese government has responded in two ways to challenges from its people: repression or stoking nationalist sentiment. If the Communist Party chooses repression, it could involve a vast expansion in military force or mobilization to affected areas, which

on its own can be destabilizing to neighboring countries as Chinese intensions grow murkier. Alternatively, as India grows stronger and consumes a larger proportion of resources and trade, nationalist sentiment to maintain China's standing could be used to focus internal dissent on India as a foreign distraction (similar to China's focus on Japanese atrocities in WWII). Even benign Chinese growth will cause friction as it seeks to expand its influence and fulfill the needs of its modernizing population. Although India does not want to appear confrontational and views the rising tide of globalization as beneficial to both nations, it cannot ignore the risks associated with this growth. Indeed, it is reasonable to project that the closeness between India and the United States will continue to solidify as China grows and flexes its muscles across the Asian continent. Consequently, this relationship will be driven as much by China's growth and actions as by any US policy or effort.

Chinese and Pakistani Perceptions

Despite its own growth rates and optimistic future, China's security calculations will change and grow more complicated as it looks not only at the relative decline of the United States but also at the rising power of a regional rival. China will have to assume that just as its own foreign policy grew more assertive with its increased share of global GDP and trade, India's will most likely do so as well. However, China will not have a long history of Indian assertiveness, as with the United States, to gauge probable Indian reactions to its maneuvering. Furthermore, this growth in Indian military spending will appear to China similar to the way Chinese military advances appear to the United States—that of a lesser but growing power hedging against the influence of the greater power. So, as the United States frets about Chinese antiaccess weaponry, the Chinese may see the Indian military buildup as a bulwark against Chinese influence in the region. No other nation on India's periphery would merit this level of military expansion. Although India and Pakistan continue their decades-long rivalry, India's conventional might is far superior to Pakistan's and does not necessitate this level of growth to maintain deterrence, particularly in naval power, a service that would have limited utility in a localized conflict with Pakistan. China also will be forced to deal with the asymmetry of a potential rivalry with both the United States and India where antiaccess weaponry that may be successful at challenging US power

projection in the Pacific Ocean may have limited utility vis-à-vis India. And unlike the United States, which must project power across a massive ocean, India will forever be present in the neighborhood and adjacent to many areas of Chinese interest. These are not hypothetical concerns but are founded on real differences between the two nations. These include, but are not limited to, unresolved border claims that have previously led to war, growing ties between China and Pakistan, Indian support of the Dalai Lama, Chinese blustering in the South China Sea, and concern over Chinese warships patrolling the main south Asian trade routes. Therefore, it is hard to imagine how two nations with these divergent interests can rise so quickly and not view one another with guarded suspicion.

In its bilateral relationship with China, the United States is trying to pursue a policy of cautious engagement where it welcomes Chinese growth and modernization and encourages participation in a constructive manner on the world stage. Nevertheless, the United States cannot deny the realities of power and is simultaneously hedging its bets for any future disagreements. As it is trying to deepen engagement with China, evidenced by Admiral Mullen's trip to bolster Chinese goodwill,[36] it recognizes that promoting ties with India may raise serious questions in China about US intentions. These are legitimate fears of encirclement by the United States or active attempts to undermine Chinese growth and power. However, the United States should not retreat from efforts to improve its position in the long run, even though it may risk antagonizing the Chinese leadership today. There are worries that each country is acting to strengthen the belief that conflict is inevitable and that pursuing this relationship with India will merely reinforce that cycle, but it is also possible that this friction will continue to rise, even without closer US-Indian cooperation. As China develops a weapon whose only plausible purpose is to counter the US military, it is hardly sensible strategy to pull back and do nothing in the hope that a peaceful transition of power will occur in the future. Despite US efforts in recent years to improve understanding between the two nations, concerns over Chinese secrecy and lack of transparency remain or have grown worse with the development of its new J-20 stealth fighter,[37] long-range antiship ballistic missile,[38] advanced submarine technology, and the forthcoming launch of its first aircraft carrier.[39]

Besides its dynamic relationship with China, the United States has been engaged in a delicate balancing act between Pakistan and India. Without a doubt it has significant interests with both nations, but it is an unfortu-

nate fact that assistance to one is viewed with suspicion by the other. The historical animosity from partition; wars in 1947, 1965, 1971, and 1999; the dispute over Kashmir; and nuclear rivalry all serve as reminders for how difficult it will be for both nations to reconcile their differences.[40] Additionally, Pakistani support to the United States following 9/11 has been of both crucial and disputed sincerity in recent years. For the foreseeable future, the United States will need to rely on Pakistani cooperation as it continues to fight al-Qaeda and associated extremist groups. However, US grand strategy cannot forever prioritize the "AfPak" theater over other vital security concerns. At some point the United States will conclude its massive involvement in the region, and its concern over Pakistani dislike of its Indian policy will have to diminish. Meanwhile, there are a few basic policies the United States can pursue to ameliorate friction with Pakistan over closer US-Indian ties. It can publicly support the independence of Afghanistan to prevent its use as a client state and affirm US commitment to a peaceful resolution of the Kashmir dispute. It can also push through the pending US-Pakistan bilateral investment treaty (BIT) and revisit US-Pakistan free trade agreement negotiations to complement the closer economic ties with India.[41] The conclusion of a BIT or FTA can do far more to benefit the Pakistani economy than will a mere increase in aid. The United States should also take the lead in promoting greater economic ties between Pakistan and India as a further confidence-building measure.

Finally, a more contentious strategy might be to focus India's military support on weapon systems that are less provocative toward Pakistan. These might include naval modernization and airlift and surveillance platforms, while ignoring ground attack systems such as APCs, artillery pieces, and tanks. These ground-centric weapons would likely play a small part as a means to secure the global commons, provide stability in the Indian Ocean, or balance Chinese expansion. The Indian army is consumed with domestic counterinsurgency and obsessed with its Cold Start doctrine for war with Pakistan, thereby making power projection beyond its borders unlikely or limited to peacekeeping operations. However, this strategy of tailoring weapons and technology assistance to lessen Pakistani objections has the strong potential to harm the very ties with India the United States is trying to cultivate. This policy would make US-Indian defense ties (an enormous aspect of this budding relationship) constrained by the concerns of Pakistan rather than driven by robust strategic analysis. It may also be misconstrued as viewing the India-Pakistan conflict as the central or over-

riding issue in US-Indian relations. This option seems highly unlikely, and the United States should focus on economic initiatives with Pakistan as the primary mitigater. And since Pakistan will most likely view any security assistance to India as threatening, the United States can expect to see even closer ties between Pakistan and China in future years as Pakistan seeks a nearby ally who will not provide in-kind support to India. Moving forward, the United States should disaggregate its substantial interests with Pakistan from its overtures to India in the hope of maintaining good relations with both. In fact, India's own strategic restraint and wariness of a formal alliance with the United States may assist the US-Pakistan relationship by limiting cooperation to a more subtle level.

Despite Chinese and Pakistani concerns governing closer ties between the United States and India, the United States must pursue sensible policies to ensure its involvement in Asia far into the future. The blending of Indian and American interests should yield a productive partnership as the United States adapts to the new powerful nations growing over the horizon. That is not to say there will not be disagreements between the two nations, but rather both states should strive to continue their path to cooperation despite any setbacks in the political arena. Forging these relationships takes time, effort, and consistency; but with the proper direction, this strategy will ensure the United States is prepared to evolve and maintain its influence far into the future.

Diplomacy and Economics

During the Cold War, the United States forged a relationship with another growing power facing uncertainty in its future. That nation had a long and distinguished history of independence and self-sufficiency, yet it also recognized the benefits of partnering with the United States as an equal power with converging interests. Given its tradition of independence and pride, that nation faced strong domestic pressure to view the United States as anything but an ally. However, the two nations were able to forge a surprisingly delicate yet malleable relationship to resist the expansion of Soviet power while simultaneously improving relations between the two governments and their economies. In the early 1960s, few strategists and diplomats would have predicted that China and the United States would initiate a process to reconcile their differences in the interest of resisting a common foe. In the early stages of this opening, both countries

continued their domestic propaganda opposing one another while quietly moving toward rapprochement. While circumstances of the US-Indian relationship are vastly different (and much more amicable) today, there are, ironically, lessons we can take from this 1960s opening to China in understanding a US-Indian strategic course vis-à-vis China.

On what basis might the symbol of the capitalist world partner with Communist China at the tail end of its Cultural Revolution? Henry Kissinger argues this was accomplished through a system of "common convictions, not formal obligations."[42] Neither country was able or willing to sign a mutual defense treaty nor other sort of alliance obligation similar to those concluded between the United States and its European allies. The countering of Soviet influence in Asia would require a more subtle and, in Kissinger's eyes, strict realist approach.[43] While it might seem absurd to compare Nixon's opening to China with our current efforts to co-opt India, the idea of pursuing a relationship based on parallel interests in the absence of a formalized alliance is highly relevant. There are fundamentally different interests at play in today's Asian environment, but the concept is still valid.

The China of today is not the Soviet Union of yesterday. There are major differences in ideology, action, and especially, formal pronouncements of strategy. It is worth emphasizing that the United States should not try to revive George Kennan's containment strategy to resist some fanciful overt military drive for Chinese hegemony in the near term. The United States and Cold War–China faced a clear and common enemy whose conflicts had erupted into military force (through proxy with the United States and directly with China in the Sino-Soviet border clashes of 1969).[44] Today the Indians have a lasting border dispute with China but have not faced it militarily for five decades and actively seek its cooperation. While China's opaque military buildup and mercantilist policies may be disconcerting and require hedging, any sort of containment strategy would be unpopular as well as geopolitically and economically unstable. Although the United States and Cold War–China faced a common enemy, they lacked the shared attributes of the US-Indian relationship that are more suited to an enduring partnership—a common ideology and political system and a robust set of shared interests like those enumerated above. While contemporary China may concern both the United States and India without classifying it as a "common enemy," the two nations can instead rely on a list of other interests to encourage this partnership.

The lesson is clear: the United States and Cold War–China were able to generate their partnership by "sidestepping the rhetoric of two decades and staying focused on the fundamental strategic objective of a geopolitical dialogue leading to a recasting of the Cold War international order."[45] While the United States is not attempting something as dramatic as recasting the Cold War international order, it is looking to generate a strategic direction with India. As Kissinger noted, "The opening to China was part of an overall strategic design, not a shopping list of mutual irritations."[46] While this may sound sensible, India may be more interested in that shopping list of issues and a more transactional relationship rather than weaving together disparate policies to advance the more strategic partnership the United States desires.

Recognizing the pride and history of Indian strategic thought (strategic restraint, nonalignment, anticolonialism), we can generate a lasting partnership to pursue parallel interests without forcing India to feel like a junior partner or supplicant for US assistance. The United States can recognize India's autonomy and encourage greater cooperation by continually acknowledging the nature of this relationship and the boundaries of cooperation. Although some in the United States may want this shared strategic vision to be an overt China-balancing posture, this will surely not materialize. Instead, the United States can tangentially prepare to achieve that goal by guiding a strategic outlook that focuses on economic opening and a security structure of providing stability through pursuit of shared interests as opposed to a unifying agreement on a shared worldview. In this way, the United States can foster bilateral ties and conclude efforts on shared issues to move forward, albeit in an occasionally disjointed fashion. Thus, as the United States approaches India to generate the desired strategic partnership, it must recognize that, in the short run, the relationship may be marked more by high-profile transactional failures—like the exclusion of US fighters from the medium multirole combat aircraft (MMRCA) deal and India's nuclear liability legislation[47]—as opposed to concrete successes of diplomatic heft.

The challenge on the diplomatic front will be to recognize where interests intersect and generate mutually agreeable policies to advance those interests. Without the concrete obligations of a treaty or alliance, or the bond of a common enemy, those interests can be miscalculated or prioritized differently. This could lead to diverging interests causing the delay or obstruction of progress. One such interest is India's pursuit of

Iran as a "strategic rear base" or future energy partner.[48] Specifically, it is strongly interested in a plan to pipe Iranian natural gas directly to India through Pakistan.[49] The close Indian-Iranian relationship is difficult to reconcile with US efforts to isolate Iran and muster international support for additional punitive actions. Therefore, the United States must diplomatically and strategically pursue broad, regional objectives while retaining the ability to compartmentalize sensitive issues. If the United States and China could overcome their differing interests over Taiwan (including two Chinese artillery campaigns against the Nationalist-held islands in the 1950s),[50] few policies should restrain US-Indian progress.

The following policies could each be viewed as an individual issue, but the enduring challenge is to use them as tools to create a broader strategic direction beyond the simple talk of a brighter future of cooperation. There will not be one policy that magically promotes the relationship or convinces India to form an alliance. Instead, the relationship must grow through a series of reforms and initiatives, most rather banal on their own, but the accumulating successes will lead to greater ties and influence in the aggregate. These proposals are a brief synopsis of a few major policies that must take place to keep the US-Indian relationship from stagnating.

To begin, the United States and India should look at their economic ties as a main avenue to closer integration and cooperation. Although bilateral US-Indian trade has grown substantially, the United States lags behind the UAE in absolute terms as a trade partner with India, while India is only the 12th largest trading partner for the United States.[51] As an impetus for expanding these ties, the United States and India should revitalize negotiations for a bilateral investment treaty as well as a free trade agreement, though this may not be politically feasible for the United States,[52] or even for India. This was recently demonstrated by the Indian government's acquiescence to domestic pressure to abandon a proposal allowing large foreign retailers and supermarket chains into its domestic market.[53] As for an FTA, the United States still lags behind the European Union, Japan, South Korea, and ASEAN member states that have either concluded this agreement or are drawing closer to doing so.[54] Additionally, the United States should partner with India in regional and global trade regimes, harmonizing efforts through the World Trade Organization and the Doha Round, as well as opening more opportunities for private sector US-Indian ties through business forums and expanding the H1B visa program.[55] These efforts to lower barriers to foreign direct invest-

ment, remove onerous offset requirements, and abandon foreign owner-ship restrictions will yield macroeconomic benefits to all nations involved. However, it is unlikely India will wholeheartedly adopt these reforms in the short run due to the political challenges enumerated above, although there has been limited progress in allowing "qualified" foreign investors to invest directly in Indian equities.[56] The United States and India should also build on their recent collaborations at the G-20, the Nuclear Security Summit, and the Global Counterterrorism Forum and use these efforts as a foundation and vehicle for further progress on important economic and security issues.[57]

The United States and India have yet to build on the historic civil nuclear agreement of the Bush administration. Some important steps toward nuclear cooperation would be to reevaluate export control restric-tions, lower barriers to trade and technology transfers, and usher India into the vast array of nonproliferation regimes (including the Nuclear Suppliers Group, Missile Technology Control Regime, Australia Group, and Wassennaar Arrangement).[58] This can build on the removal of several subsidiaries of India's Defense Research and Development Organization (DRDO) and Indian Space Research Organization (ISRO) from the US Entity List to allow greater high-technology trade.[59] The United States should also aim to harmonize Indian "laws, policies and practices to those of NPT members, irrespective of its non-member status"[60] as a way to move past the deadlock of insisting on India's acceptance of the Nuclear Non-proliferation Treaty. Finally the United States should continue to support India's permanent membership on the UN Security Council (UNSC) in an effort to move membership toward a more balanced composition. This support should progress with a comprehensive initiative or time line, perhaps as part of a broader UNSC adjustment that jettisons previous US objec-tion to the G4 proposal (Japan, Germany, India, and Brazil).[61] This could accompany a recalibration of a number of international institutions, such as ending European domination of the IMF, to gain greater emerging market buy-in.[62] Granting India greater responsibility and visibility through a prominent role in these institutions can help it evolve away from its strategic restraint and move toward a more substantial global role.

Defense and Security Cooperation

Along with broader diplomatic and economic approaches, the more prominent aspect of the US-Indian relationship will be the substantial

defense and security ties between the two nations. It is worth reemphasizing that an increased defense relationship will not directly lead to a formal alliance. The world seems to be moving away from rigid security pacts between nations, and the United States should resist the temptation to attempt to codify this relationship. India is not likely to pursue policies that deliberately or openly antagonize its Chinese neighbor, and a formal alliance would most certainly do so. Its interests at the moment dictate that it pursue an amicable relationship with China and all its other neighbors (although its efforts have had mixed success), and we must keep that in mind before charging headlong into pursuing a NATO of the east. Despite these limitations to a security relationship, there are a number of measures the United States can pursue to generate a more comprehensive partnership that builds the capacity of the Indian defense establishment while improving interoperability between US and Indian military forces.

Before detailing policies to advance this goal, it is necessary to briefly discuss the Indian military services and their potential contribution to a US-Indian defense relationship. Looking at potential benefits, we see the security of the Asian continent and the Indian Ocean as the primary focus for the near to midterm. India also has a distinguished history of international peacekeeping. The potential areas for US-Indian cooperation argue strongly for an air and naval service priority. The Indian army's capability for power projection is limited to its Cold Start doctrine of a swift cross-border movement into Pakistan, and its preoccupation with the Pakistani threat, border defense, and assisting police and paramilitary forces with domestic counterinsurgency and counterterrorism operations makes it unlikely to play much of a combat role outside its immediate borders.[63] Conversely, the Indian navy has been steadily increasing its strategic outlook and is moving toward an ability to exert sea control throughout the Indian Ocean, with a focus on economic and energy security. It has repeatedly sailed with various partner nations where its performance has been "rated as NATO-quality," it maintains two separate fleets, and it has been viewed as the primary service for India's strategic projection.[64] Airpower represents another opportunity for India to generate strategic effects, and the Indian air force is moving beyond its highly capable airlift and reconnaissance operations to a more offensively oriented doctrine and posture most evident in its significant purchases of aircraft and technology.[65] Indian air and naval power will play a crucial role in the emerging Air-Sea Battle concept, a method of operation under development by US planners to

counter sophisticated antiaccess and area-denial weaponry. Designed to cope with the "tyranny of distance" and the vulnerability of forward bases, this strategy will need the cooperation of capable allies positioned at the center or immediate periphery of possible zones of confrontation and conflict. India is one of the few nations that can potentially satisfy these requirements and provide the United States with greater flexibility to pursue this strategy. Given this understanding of US-Indian security goals and the likely involvement of Indian military services, the following defense and security policies are needed to translate US strategic aims into positive action.

Revitalize US-Indian Defense Exercises

One of the primary methods for increasing both the capacity and compatibility of the Indian military is to revitalize US-Indian defense exercises. These exercises allow the exchange of important lessons learned, familiarize both nations with the operations of their counterparts, and lay a bedrock of understanding for future cooperation. The United States and Indian militaries have successfully concluded a number of exercises over the previous decade. While the two armies have successfully interacted on counterinsurgency, jungle warfare, and contingency operations, this has been on a much smaller scale to the cooperation seen in the other services, and experts argue that the Indian army is "not yet ready for complex joint exercises or for exploring new strategic roles."[66] The bilateral engagements should continue, nevertheless, and eventually expand despite these limitations.

The Indian and US navies have participated in a series of bilateral and multilateral exercises. These provide extensive learning opportunities for both countries, especially during the annual Malabar series, the 15th of which was completed in April 2011. During the Malabar maneuvers (in some years a purely bilateral arrangement between the United States and India, and in others a multilateral affair including Australia, Japan, and Singapore), the various navies involved "execute anti-submarine warfare, surface warfare, air defense, live-fire gunnery training, and visit, board, search and seizure (VBSS) evolutions."[67] This cooperation has also included diving and salvage rescue exercises, the sixth completed in January 2011.[68] Although the "Indian Navy has more joint exercises with the US than any other nation,"[69] it is imperative to continue building on these recent successes. These maneuvers should move into more robust arrange-

ments farther from Indian shores and incorporate short-notice and less-scripted exercises to simulate responses to incidents over the vast expanses of the Indian and Pacific Oceans. These could eventually move to exercises conducted at multiple locations to test the organizational and logistical capability of the two forces to operate toward two or more ends simultaneously. Given the sharp Chinese response to the multilateral Malabar 2007 exercise, which it viewed as an anti-Chinese war-game alliance, the US and Indian navies must move cautiously when reincorporating other nations into these exercises.[70]

The US and Indian air forces have also undertaken a number of exercises in the previous decade. The most widely discussed were Cope India 04 and 05. During these exercises, USAF F-15s and F-16s flew multiple rounds of simulated air combat against their Indian counterparts operating a variety of fighters, such as Russian Su-30s, MiG-27s, and MiG-21s and French Mirage 2000s. Although these exercises were helpful to evaluate air combat tactics, many observers were more interested in the results of head-to-head engagements between foreign- and US-built fighters to determine the superior aircraft.[71] In particular, many arguments surrounding the exercise pointed to Indian successes against American aircraft as an argument for additional F-22 procurement. This narrow and singular focus is misplaced. Rather than pursuing an isolated competition to gauge US equipment, these exercises must occur regularly with the aim of laying the bedrock for sustained US-Indian cooperation, not competition. The United States has moved in the right direction through its Red Flag 08 and Cope India 09 exercises that at least aimed to place US and Indian forces in collaborative as opposed to adversarial arrangements. Additionally, Cope India 09 aimed to generate partner capacity in an airpower competency most likely to be used in the near future: airlift operations in support of humanitarian or disaster relief efforts.[72] These exercises are limited in nature and over time need to broaden into more robust interservice exercises that better reflect future conflict scenarios and the US focus on the Air-Sea Battle concept of operations. Like the Navy's Malabar exercises, they must become more regular with yearly or biyearly appearances at existing operations such as Red Flag, as well as generating US-India-specific exercises on both Indian and US soil. These exercises should aim to not just share how each other operates but to also leverage that knowledge to generate policy and a bank of best practices that both forces can rely on in future real-world scenarios as they develop concepts

on how to operate effectively together. They can also focus on limited conflicts, with an emphasis on the ability to fight decisively without forcing the opposing side to escalate, particularly if the opponent is a nuclear-armed state.[73] Obviously, these levels of exercises are complex and require a general evolution as the Indian military modernizes and the military relationship between the two countries matures. Regardless, it is useful to have an end goal in mind.

Encourage Military Equipment Sales and Joint Development

Perhaps the most visible sign of Indian military modernization is the massive purchases of equipment and aircraft. It is also important to recognize the substantial political benefits some countries have gained by exporting vast amounts of military material to India. Unfortunately, the concrete successes from this type of policy can be hard to cite. For example, Israel is the second highest provider of weapon systems and associated equipment to India, but these sales have yielded little in the political or diplomatic arena. Despite numerous sales and joint development, the Israelis were rebuffed on the international stage when India professed its "commitment to the Palestinian cause" and voted to support the Goldstone Report in the United Nations, a damning report accusing both the Israelis and Palestinians of possible war crimes in the Gaza Strip.[74] India also cosponsored an amendment condemning Israeli settlements (ultimately vetoed by the United States) and promised to support Palestinian membership in the UN.[75] These political setbacks for the Israelis help highlight an important point: that the varied tracks of sustained partnership building may operate at different speeds and yield benefits and/or setbacks simultaneously in different areas.

Despite any limitations of military sales in the political arena, these sales will still be an important facet of our relationship. They can help promote trade and similarity between the two militaries, and the US military can assist these efforts through showcasing the capabilities of its equipment at exercises and encouraging more exchange programs to train on US equipment. This can help overcome Indian reticence to rely on the United States for weapons systems and support after these were cut off by sanctions following its 1965 war with Pakistan and 1998 nuclear test.[76] The difficulty in implementing this policy is that in the long run it may be difficult to sustain. It runs counter to Indian efforts to increase their own domestic production, and the United States may have difficulty competing with other foreign sales, as revealed in the decision to exclude both

American aircraft (F-16 and F/A-18) from the MMRCA competition, a lucrative deal worth approximately $11 billion.[77] A large part of this denial was possibly due to US export control restrictions on sensitive technology and may yield a lesson for both countries to lower their barriers on the transfer of technology and equipment. The United States is challenged with trying to conduct more sales in an environment of greater diversification among Indian suppliers. This may or may not be intentional, but the recent decision to favor the Rafale and Eurofighter in the MMRCA competition demonstrates the importance Europe will have alongside Russia, Israel, and the United States in fulfilling India's military hardware needs.

India has already proven to have one of the world's most significant appetites for weaponry and new technology, surpassing China to rank as the top arms importer in the world.[78] It has aggressively pursued equipment, aircraft, and ships from numerous nations and suppliers, including a number of US purchases such as 12 P-8 surveillance aircraft, the amphibious transport ship USS *Trenton*, and possibly the Apache Longbow and E-2D Hawkeye.[79] Although the United States failed to secure the MMRCA deal, the Indian parliament has approved the purchase of 10 C-17 aircraft (with possibly 5–7 more) [80] and 6–12 C-130Js at a cost of $4.1 billion and $1 billion, respectively.[81] But even these purchases were forced to abide by India's 30-percent offset rule, which requires Boeing and Lockheed Martin to invest 30 percent of the contract in India's domestic aerospace and defense industry. In the case of the C-17 buy, this investment includes engine test and wind tunnel facilities for India's DRDO.[82] This policy has the obvious long-term aim of producing a domestic industrial-security apparatus capable of fulfilling India's equipment requirements to reduce the need for foreign purchases. If successful, the prospects for military hardware sales to India may be greatest in the short to medium term, but the United States can evolve this relationship over time away from direct sales of completed systems and more toward joint development. Although the United States faces challenges in increasing military equipment sales to India, this is still an important component of increasing US-Indian ties and harmonizing military relationships.

Actively Pursue Joint Disaster Relief Work

To build on the successes of US-India joint naval tsunami relief work in 2004 and Exercise Cope India 08,[83] the United States needs to actively include India in its efforts to provide disaster and humanitarian relief. One

missed opportunity was the Japanese disaster in March 2011. The United States mounted a significant relief operation to the hard hit areas of Japan, including massive naval support from the US Seventh Fleet, airpower logistics support, and even an MC-130 and special tactics team flying into Sendai to open the airfield and stand up air traffic control support.[84] This disaster was of such massive proportions that partnering with India on the substantial relief efforts involved could have provided real-world experience for conducting joint humanitarian missions in the future. Previous cooperation between the two navies during the 2004 tsunami relief effort in South Asia was notable and should have provided a baseline of cooperation for future efforts farther abroad. However, this experience was not translated into more active cooperation on the humanitarian efforts for Japan in the Pacific region, where the US and Indian navies strive to operate jointly.

The United States and India opened the door to cooperation with the recent sale of the USS *Trenton*, C-17s, and C-130s mentioned above. Not only does this equipment help strengthen India's logistical capacity and strategic and tactical airlift, it also provides India a useful tool for ferrying supplies and personnel for disaster response. The United States can leverage these sales into future cooperative exercises, like Cope India 08, and eventually pair this equipment with its American counterparts on real-world humanitarian operations. And since humanitarian aid and disaster response are relatively uncontroversial and nonthreatening, the two countries can use these efforts to increase compatibility and contacts between their forces without appearing confrontational or truculent toward other nations.

Promote Greater Educational Ties

US programs on security assistance to foreign nations comprise a number of elements, chief among them educating foreign military personnel. India is one of only 10 nations invited to participate in the USAF School of Advanced Air and Space Studies (SAASS) program to develop future strategists. However, none of the military education programs have mirrored the rapid growth of Indian students in American civilian universities, which count nearly 100,000 young Indians among their student bodies.[85] Despite the rising importance of India in US grand strategy, the money it receives as part of the US International Military Education and Training (IMET) program has plateaued over

the past several years (see fig. 1). Rather than a constantly upward slope, IMET appropriations for India instead follow a more sporadic pattern.
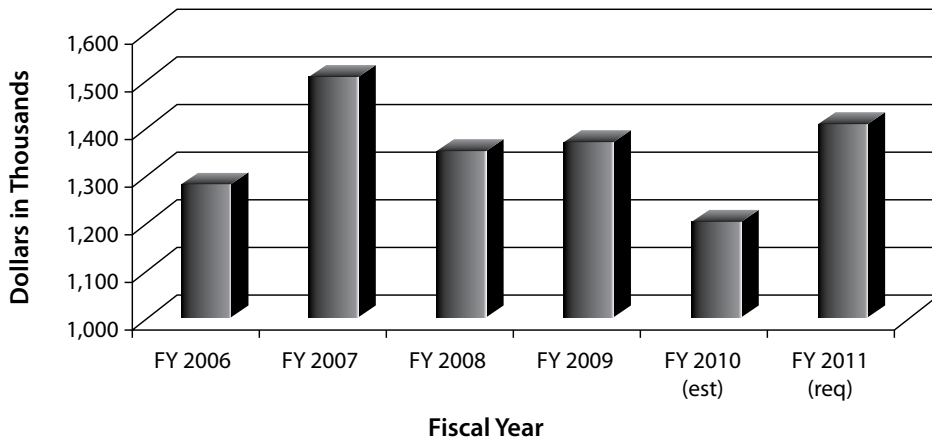

Figure 1: Indian IMET funding, FY-06 to FY-11
(Data compiled from Department of State, "International Military Education and Training Account Summary," Undersecretary for Arms Control and International Security, 23 June 2010, http:// www.state.gov/t/pm/ppa/sat/c14562.htm.)

A large part of Indian security modernization revolves around not only the military exercises mentioned above but also addressing the organizational shortcomings of the Indian defense establishment. Increasing the participation of Indian officers at all levels of US PME programs is essential to building capacity, interoperability, and positive relationships between future leaders. To supplement this formal education, there need to be dedicated gatherings that bring together the best strategic thinkers from both nations to develop long-range strategy and help give focus to the ever-growing number of exercises between India and the United States. There should also be a focus on educating senior civilian leaders, since a demonstrated lack of expertise among politicians and bureaucrats exists in the defense realm.[86] This education should include formal training in service schools as well as informal conferences and observer roles for senior Indian military and civilian personnel to glean lessons learned from the US military (particularly on joint operations and organization) that they can apply to India's own reforms.[87] Therefore, this focus on increasing partner capacity must include the Indian defense bureaucracy, not merely its military forces.

Generate US-Indian Tabletop Strategic Exercises

In addition to bringing together strategists from each nation, it is worthwhile to involve operational commanders and their staffs in tabletop strategic exercises. These exercises have been highly successful at all levels of the US government to help participants think through their responses to a critical event. These simulations have helped senior officials assess their ability to respond to crises ranging from bioterrorism to the loss of critical energy infrastructure.[88] Such exercises require minimal resources aside from a dedicated facilitator and the cost to transport, house, and feed exercise participants. Yet, the gain from these simulations is invaluable, since it can expose gaps in strategy, resources, or time lines and help smooth out processes in preparation for a real-world event. Tabletop exercises are also less provocative than conducting massive military exercises near the border or off the coast of a nonparticipating country. Therefore, the United States and India should move toward yearly tabletop simulations concurrent with or in addition to existing joint exercises.

Increase Cyberspace Cooperation

While US-Indian cooperation in cyberspace remains in its nascent stages, the two countries signed a memorandum of understanding allowing their computer emergency response teams to coordinate efforts on cyber security, cyber policy, and responses to cyber attacks.[89] It is critical to build beyond this "understanding" and toward concrete activities that can complement more traditional defense and military coordination. Combining US and Indian power in the future will depend in large part on the ability to fuse coalition cyber operations into the battlespace. Given the highly sophisticated cyber warfare capabilities of other Asian nations, it is possible that a future conflict could be limited to the cyber or information realm and never involve hypersonic missiles or Su-30 aircraft (the 2007 cyber attack on Estonia provides a quick example).[90] Cyber attacks may also act as the opening salvo or accompany conventional actions in a future conflict, most notably demonstrated in the Russian invasion of Georgia in 2008.[91] To prepare for this contingency, it is critical the United States assist the Indian air force in developing a robust cyber warfare capability and also conduct exchanges and exercises similar to cyber coalition events among NATO countries.[92] Understandably, this may cause worries about sharing sensitive information, tactics, and procedures. However, both countries have conducted numerous ground, naval, and air combat

exercises around the globe while still safeguarding national secrets, so it is reasonable to assume that this capability exists for cyberspace cooperation as well. Although cyberspace has only recently gained importance as a medium of warfare, we cannot ignore its crucial role in future high-technology societies. Furthermore, cyberspace cooperation must extend to the civilian sector and help defend against cyber espionage and cyber terrorism to protect each nation's infrastructure in its increasingly entwined economy. A number of conferences and summits are slated to address the legal, political, and technological challenges of these issues, and the United States and India must remain at the forefront of this discussion and coordination.[93]

Expand Counterpiracy Efforts

As the frequency of attacks, size of ransoms demanded, and duration of kidnappings have accelerated over the past decade, international efforts to reduce piracy and secure vulnerable waterways have taken on greater importance. Cooperation on counterpiracy efforts thus becomes another important component of US-Indian engagement. There are a number of multinational task forces (from the EU, NATO, and CTF-151) operating near the Horn of Africa and throughout the Indian Ocean, bringing together navies from around the world to address this problem.[94] India is not a participant in CTF-151, but it has demonstrated a willingness to cooperate with other navies to combat piracy, although it retains its own national command to do so. It has consistently helped patrol the western Indian Ocean and Gulf of Aden, escorting ships through the internationally recommended transit corridor (IRTC), and it remains a critical participant in the shared awareness and deconfliction (SHARED) meetings.[95] This cooperation must continue beyond the Horn of Africa and extend to more robust efforts around the eastern reaches of the Indian Ocean and beyond. While the most effective antipiracy measures involve a coordinated sea and land strategy to dampen pirate success while addressing the underlying causes, this effort can help stem the tide and, more importantly, create additional opportunities for the United States and India to pursue joint objectives.[96] This cooperation can extend beyond the purely naval realm as surveillance aircraft and remotely piloted aircraft (RPA) help augment surface ships to monitor vast expanses of the ocean.[97] Therefore, the United States and India can use counterpiracy efforts as a vehicle for greater coordination and cooperation throughout the Indian Ocean region.

Assist with Counterterrorism

Although counterterrorism efforts between the two nations may have little direct application to the Asian balance of power, this remains an important aspect of US-Indian cooperation and provides another shared interest the nations can jointly address. The post–9/11 environments, and more specifically the 2008 Mumbai attacks, have generated an unprecedented acceleration of counterterrorism cooperation between the United States and India. Intelligence sharing, high-level diplomatic conferences and agreements (including the Joint Working Group on Counterterrorism and the 2010 Counterterrorism Cooperation Initiative),[98] and joint initiatives to combat terrorist financing, maintain critical infrastructure, and improve policing strategies must continue. This effort must also address the significant shortcomings in Indian police manning, funding, and resources.[99] Similarly, intelligence-sharing efforts will encounter difficulties with India's domestic and foreign intelligence agencies, the Indian Intelligence Bureau (IIB), and the Research and Analysis Wing (RAW). Some observers have noted significant problems in capacity as well as intelligence sharing between agencies, probably resulting from a political distrust of a strong police and military apparatus.[100] David Malone argues, "The Indian Intelligence Bureau is somewhat more competent than its external intelligence apparatus, the Research and Analysis Wing, but IIB barely knows, most of the time, 10 percent of what is going on within India, much less is it capable of any sort of projecting cooperation."[101] In addition to difficulties with the police and intelligence agencies, two other related issues generate friction between the United States and India regarding counterterrorism— the US relationship with Pakistan and the status of Kashmir.[102] US efforts to retain Pakistani cooperation in Afghanistan and its border region have created a perception in India that the United States may not take a hard enough line on Lashkar-e-Taiba and its alleged ties to Pakistani intelligence for fear of jeopardizing Pakistan's assistance or appearing to side with India over the Kashmir dispute.[103] Although there is a role for the Department of Defense in advancing counterterrorism cooperation, the most significant advances for increasing Indian capacity involve internal resourcing and cultural changes to the Indian intelligence, police, and paramilitary forces. However, the DoD can assist in counterterrorism training and equipment to assist other US agencies (e.g., the FBI) with their current involvement in bolstering Indian counterterrorism.

Conclusion

Over the coming decades, the United States will need to adjust to new realities evolving from growth of the world's most populous nations. The shift in the global balance of power has tilted toward Asia, recognizing its phenomenal growth as well as unrivaled potential for future economic, military, and diplomatic power. An informed US policy toward Asia demands a closer relationship with the world's largest democracy. This is essential for both countries' interests and forms a crucial pillar of a China-hedging and, if required, China-balancing strategy. The above recommendations represent an initial vector to develop an Indian-American partnership and identify policies to advance its strategic direction. Fundamentally, the United States must understand that this process will not be fast and will be marked by setbacks with possibly few short-term gains, but the general direction is sound and requires a tireless persistence across multiple administrations and a patience that may be uncharacteristic for a typically impatient American public. However, with the proper focus and attention, the United States can develop a conscious policy toward India that develops a strategic partnership and ensures the protection of American interests in the coming decades. **SSQ**

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Book Reviews

Getting to Zero: The Path to Nuclear Disarmament edited by Catherine
McArdle Kelleher and Judith Reppy. Stanford University Press, 2011, 404
pp., $80.00.

In her introduction to this collection of essays, Catherine McArdle Kelleher
states that the editors "took as a given that complete nuclear disarmament will
happen and focused our attention on what that will imply. We agreed to take
as our guiding principle that any proposals for policy should advance the cause
of going to zero." Therefore, she explains, "the chapters in the book do not
debate whether going to zero is feasible or a good idea. Instead, they address
in some detail what nuclear zero will mean for existing institutions, issues, and
practices." Kelleher sees the work as "the beginnings of a roadmap to a world in
which nuclear weapons will no longer be the currency of power, but instead a
historical memory" (p. 1). While this reviewer considers this goal overly ambi-
tious, *Getting to Zero* does provide valuable insights to a variety of topics relevant
to the subject of global nuclear disarmament.

The 19 chapters provide an international perspective, examining the nuclear
arsenals of the United States, Russia, the United Kingdom, France, China,
Israel, India, and Iran. An initial section, entitled "How We Got to Where We
Are," opens the discussion of nuclear disarmament, which concludes with two
chapters in a final section, "What Next?" This provides the reader with broad
and focused perspectives, resulting in valuable insights into complex issues.

Because the United States is the world's foremost nuclear power, American
policy receives the most coverage. Lynn Eden's "The U.S. Nuclear Arsenal and
Zero: Sizing and Planning for Use—Past, Present, and Future," is useful to
readers seeking an explanation of US nuclear war planning and targeting poli-
cies and how these influence the size and composition of the American nuclear
arsenal. Matthew Evangelista also explores the American position in "Nuclear
Abolition or Nuclear Umbrella?" and Dennis M. Gormley describes American
superiority in conventional counterforce strike capabilities as a "balancing act."

Venance Journe discusses "France's Nuclear Stance," providing perspective on
a nation where nuclear disarmament is an issue practically closed to discussion.
Avner Cohen's chapter on Israel explains that state's policy of "opacity," which
means that Israel's possession of nuclear weapons is neither confirmed nor
denied. While France has decreased its nuclear arsenal, neither it nor Israel will
lead the global disarmament effort. The United Kingdom has limited its nuclear
capability to submarine-launched missiles, but remains committed to preserving
this force as a deterrent.

Alexei G. Arbatov takes a pragmatic approach in "Nuclear Deterrence, Disarmament, and Nonproliferation," noting that mutual nuclear deterrence between the United States and Russia survived the end of the Cold War, and despite significant reductions in the number of nuclear weapons, the threshold for their use has been lowered, not raised. He also points out that "Great Britain, France, and China are not going to undertake any limitations of their nuclear forces through arms control treaties, alleging that they lag far behind the two major nuclear powers," and "Britain and France are elaborating limited nuclear strike options of their own" (p. 92). He argues that "it will never be proved with finality that nuclear weapons and nuclear deterrence saved the world from a third world war during the Cold War decades" (p. 93). Citing the 1962 Cuban missile crisis as "the one example when the great powers came to the brink of war," he observes, "The irony of that case was that the crisis was provoked by the very nuclear deterrence that is now portrayed as an insurance against nuclear war" (ibid.). In fact, Arbatov believes that "by maintaining mutual nuclear deterrence, the great powers are wasting resources that otherwise could be applied to more appropriate military and security tasks and missions" (p. 99).

This reviewer concluded that the authors of *Getting to Zero* sincerely believe that nuclear disarmament is possible if politicians in the states possessing these weapons have the will and demonstrate the leadership to set the example. Until that happens, other states will continue on their own paths to the political power these weapons provide. Thomas Jefferson famously compared slavery to a wolf held by the ears that could neither be continuously held nor safely released. The same can be said of nuclear weapons. While this book does provide a good study of the issues, there are no clear or easy answers to the questions raised.

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Stockpile: The Story Behind 10,000 Strategic Nuclear Weapons by Jerry Miller. Naval Institute Press, 2010, 296 pp., $37.95.

"Anything that can destroy society should be understood." This simple statement by author Jerry Miller sums up the mission of his historical treatise on nuclear weapon development and deployment. The retired US Navy vice admiral writes from the perspective of a nuclear warfare practitioner at the tactical, operational, and strategic levels. This experience and authorship of an earlier book, *Nuclear Weapons and Aircraft Carriers*, clearly establish his credibility. In *Stockpile* he examines the policies and personalities surrounding the evolution of US nuclear capability, its operational organization, and nuclear deterrence theory. His narrative, both fascinating and disturbing, is consistent in its implication that nuclear weapons are severe and unforgiving and must be studied objectively and respectfully. He cites the publicly acknowledged US stockpile at

the time of writing at about 5,200 strategic nuclear weapons, of which approximately 2,200 were deployed.

Miller focuses his story through three fundamental questions: Why did the United States create a massive stockpile of strategic weapons? How did the buildup happen? And who were the individuals and groups that facilitated this process? He guides the reader from the fledgling inventory of nine atomic weapons in 1946 to the extraordinary Cold War peak of over 10,000 strategic nuclear warheads by using a top-down approach, starting with the executive visions of presidents Roosevelt to Obama. Miller then addresses the influences of policy architects in Congress and the Pentagon and describes the plans developed by military staffs, explains the technology and force structure that enabled all these efforts, and finally, outlines the consequences for the global community.

Stockpile provides insight into both the technical aspects of nuclear warfare and the personalities that shaped the force. Miller examines the influences of key players, such as Truman's policy architect Paul Nitze and Defense Secretary Robert McNamara, as well as the clout wielded by members of the Atomic Energy Commission, various think tanks, and academe. These forces ultimately expanded the stockpile well beyond Eisenhower's vision of a limited inventory of thermonuclear weapons leveraged to reduce overall defense forces. The gamut of weapon designs eventually produced by "the military-industrial complex" reflected US strategies that, in the space of a few decades, evolved from preemption to retaliation to counterforce and countervalue schemes, eventually leading to the concept of mutually assured destruction. During this same time, nations pursued treaties to keep nuclear testing, deployment, and proliferation in check. In the end, one can argue that there was never sufficient executive and legislative oversight to properly manage growth of the Cold War stockpile.

Once the United States gained such massive nuclear power, what force structure and war plans were used to exploit it? Miller describes the rise of the Joint Strategic Target Planning Staff, providing insight into the complexity of targeting processes and the concentration on mission assurance that drove planners to the preferred practice of "overkill"—placing multiple warheads on targets. Strategic weapon delivery systems were integrated into bomber aircraft as well as silo- and submarine-based missiles to form the nuclear triad. Miller describes interservice tensions resulting from triad force-mix studies such as the evaluation of the Navy's Polaris fleet ballistic missile by Air Force staffers at Strategic Air Command.

While his focus is on the strategic stockpile, Miller also discusses tactical nuclear weapons once deployed to Army artillery units as well as Air Force and Navy "dual role" tactical aircraft. He points out that deterrence achieved by the United States extends a "nuclear umbrella" integral to other countries' sovereign defenses. The author includes an overview of arms treaties and their roles in establishing some control over nuclear proliferation. He concludes with a look at future issues such as the maintenance of remaining weapons, possible new weapon designs (e.g., the reliable replacement warhead), and nonnuclear means

of strategic strike (e.g., conventional prompt global strike). Miller predicts the elimination of silo-based missiles to transform the existing triad structure to a "dyad" of Navy submarine-launched ballistic missiles and Air Force bombers, a concept reportedly being considered at US Strategic Command.

At times, Miller uses personal accounts to effectively portray the human dimensions of nuclear warfare. Although he occasionally strays into parochial lanes when advocating submarines and criticizing intelligence officers, his biases are not masked and can be forgiven when read in context. His style is pragmatic—he hits the major issues but without detailed analysis. In fact, part of the book's appeal is its concise length, relying on citations to provide credible references for further study. Still, the text misses several crucial topics—there is no discussion of the role of missile defense, the concept of the "new triad" formalized by Defense Secretary Rumsfeld during the G. W. Bush administration, or the elimination of nuclear topics from joint doctrine (Joint Publication 3-12, formally *Joint Nuclear Operations*, is now designated *Cyberspace Operations*).

Clearly, Admiral Miller seeks to educate readers that nuclear weapons have been a critical part of the global stability equation for over 60 years and will remain so for the foreseeable future. In *Stockpile*, he achieves this goal, providing an outstanding synopsis that can serve at least two audiences. First, it provides valuable background for those dealing with current nuclear force decisions linked to the *Nuclear Posture Review* and the New START in the face of looming federal budget cuts. Second, it benefits anyone studying deterrence theory by providing historical lessons learned (or perhaps, unlearned?) for possible new applications such as conflict in cyberspace.

H. G. Wells observed that "civilization is in a race between education and catastrophe." Within that context, *Stockpile* helps add reason to the often irrational dialogue surrounding nuclear weapons.

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Fixing Global Finance by Martin Wolf. Johns Hopkins University Press, 2008, 248 pp., $24.95.

Financial Times columnist Martin Wolf writes an insightful book detailing global capital flow, with special focus on the capital "savings glut" that he believes has led to the ongoing global financial crisis. Wolf's thesis is that excessive savings generated by the huge trade surpluses of export-oriented emerging Asian economies and oil-exporting nations is undermining the global economy's growth and stability.

The author believes that the savings glut is an irrational precautionary measure largely taken by nations adversely affected by the Asian financial crisis of the 1990s—the manifestation of a credit crunch which ultimately led to foreign debt default and GDP contraction. Emerging economies subsequently lost their

tolerance for debt/deficits and eventually eliminated their foreign debt obligations by devaluing their currencies. This led to massive trade surpluses and an accumulation of foreign currency reserves, resulting in the savings glut about which Wolf speaks.

Between 2000 and 2006, foreign currency reserves of the emerging market economies increased to approximately $2.65 trillion. If not for the United States implementing expansionary fiscal and monetary policies capable of absorbing these surpluses, the US and global economies would have been in trouble long ago. The author believes that global economic stability for the past 10 years has been accomplished simply by shifting the preponderance of the world's deficit onto the United States. The US economy has been absorbing about 70 percent of the surplus savings of the rest of the world, with the difference accounted for not by increased investment but by higher consumption and a lower rate of savings. This was neither desirable nor sustainable. Wolf argues that the United States is at least as much the victim of decisions made by others as by decisions made here. He and many economists believe that the current US account deficit, which equates to 7 percent of annual GDP, is unsustainable in the end. However, it would be helpful for global macroeconomic stability if fundamentally solvent high-income countries could absorb some of the excess savings of emerging countries. In other words, the US deficit should shrink but not disappear.

The author further argues that feasible changes can be made in the global finance system to promote the transfer of capital to emerging market economies without precipitating large-scale crises—thus ending reliance on the United States as the borrower and spender of last resort. Between 1955 and 1971, emerging market economies experienced no bank crises and only 16 currency crises. Then, between 1973 and 1997, there were 139 financial crises in all. The age of liberalization became the age of crises. Wolf notes that, in a kind of Catch-22, financial globalization can contribute to a country's economic development, but if the country's institutions have not reached a stable functioning level, liberalization is likely to generate crises that are themselves bad for economic development.

Emerging countries need to stimulate the inflow of foreign direct investment and portfolio equity, keeping most of their borrowing in domestic currency and creating financial systems that entail fiscal and monetary discipline. The author argues that if emerging countries are to move forward without dependence on US demand, they must achieve more-balanced growth. The key is to expand demand relative to supply, with a focus on public and private consumption. In addition, exchange rates of these countries should be allowed to rise to the extent needed to keep inflation under control. Countries with excess savings will need to learn to spend. For example, China—the world's largest surplus economy with a $1.2-trillion foreign currency reserve, a current account surplus of 12 percent of annual GDP, and a gross savings close to 60 percent of GDP— is wasteful and a destabilizing force for the world economy.

This short book, well researched, logically presented, and full of supporting charts/figures, fairly captures the widely accepted essence of the prevailing global financial crises. Although *Fixing Global Finance* does not challenge or shed any original light on the interpretation and application of monetary policy or trade theory and practice, it does articulate concisely the complexities and frailties of international finance. What makes the book most interesting is that it anticipated the current global financial crisis; however, despite his title, Wolf falls short of providing any real enlightenment on how to fix it.

This book is a tough read for those without an economic, international trade, or finance background. The language is often technical and the author's thoroughness in dealing with alternative views can dissuade the casual reader. That said, if carefully read, one can learn just as much from weighing the ideas Wolf does not support. Students, academics, and government/military professionals seeking a concise, yet advanced, level of understanding of global finance and its imperfections, should read this book.

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Nuclear Power and the Spread of Nuclear Weapons, edited by Paul Leventhal, Sharon Tanzer, and Steven Dolley. Potomac Books, 2002, 304 pp., $27.95.

The 15 essays in *Nuclear Power and the Spread of Nuclear Weapons* were originally presented at a conference held in 2001 on the 20th anniversary of the Nuclear Control Institute. Paul Leventhal founded the institute in 1981 and served as its president for 22 years. Sharon Tanzer is its vice president, and Steven Dolley served as research director at the time of the conference. The authors include a noteworthy collection of scholars, such as Richard Rhodes, author of the Pulitzer Prize–winning *The Making of the Atomic Bomb* as well as *Dark Sun*, *Arsenals of Folly*, and *Twilight of the Bombs*.

The essays are organized into four parts corresponding to the four conference sections, "How Essential is Nuclear Power?," "Can Nuclear Proliferation Be Made Proliferation Resistant and Free of Long-Lived Wastes?," "The Role of Nuclear Power in the Acquisition of Nuclear Weapons," and "Three Closing Views." Of special concern is the use of plutonium and enriched uranium as nuclear fuel and the technologies used to enrich uranium to weapon grade. The security of nuclear power plant waste and other radiological materials is a matter of concern, since terrorists could combine these with explosives to create a "dirty bomb." The enforcement of a nuclear nonproliferation regime is essential, as the Indian, Iranian, North Korean, and Pakistani nuclear weapons programs demonstrate.

In his essay "Nuclear Power and Proliferation," Richard Rhodes notes, "Solar and wind installations are inherently low capacity because their fuels, wind and sunlight, come and go. They cannot be expected to improve their capacity much

with increased operating experience, as nuclear has done. . . . Although coal is cheap, it is also deadly. Nuclear power, which could replace coal with improved efficiencies and conservation, is nearly as cheap but without the air pollution. . . . Improved efficiency at nuclear power plants has accounted for almost *half* of all industry carbon reductions" (pp. 59–60, author's italics). He also observes, "Eliminating all the nuclear power operations in the world would not prevent proliferation. . . . Instability caused by the social and economic impact of energy deficiencies "might even encourage it by increasing structural violence" (p. 63).

Although *Nuclear Power and the Spread of Nuclear Weapons* is a decade old, it is still a valuable collection of expert thought on the subject. It clearly demonstrates that nuclear power plays a vital role in meeting global energy needs, and that a rigorous international nonproliferation regime is necessary to prevent the spread of nuclear weapons. The security of fuel, reactors, and waste are also crucial to prevent terrorism, both nationally and globally.

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